CROWS LANDING 319 DEMONSTRATION PROJECT:

EVALUATION OF

BEST MANAGEMENT PRACTICES

IN CONTROLLING THE OFF-SITE MOVEMENT OF

PESTICIDES AND SEDIMENT

WEST STANISLAUS

RESOURCE CONSERVATION DISTRICT

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This report was submitted in fulfillment of State Water Resources Control Board Grant Agreement No. 1-120-255-0 by the West Stanislaus Resource Conservation District under the sponsorship of the State Board. Work was completed as of June 30, 1995.

This project has been funded wholly or in part by the United States Environmental Protection Agency using grant funds under Assistance Agreement C9009625-91-0 to the State Water Resources Control Board and by Grant Agreement No. 1-120-255-0 in the amount of $82,050.00 for the implementation of the Nonpoint Source Management Program. The contents of this document do not necessarily reflect the views and policies of the Environmental Protection Agency or the State Water Resources Control Board, nor does the mention of trade names or commercial products constitute endorsement or recommendation for use.

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June 30, 1995

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF GRAPHS

LIST OF MAPS

LIST OF APPENDICES

LIST OF ACRONYMS

ASTM: American Society for Testing and Materials

BMPs: Best Management Practices

Cal-EPA: California Environmental Protection Agency

cm: centimeter

DCP: Data Collection Platform

DDD: 1,1-Dichloro-2,2-bis(p-chlorophenyl)ethane

DDE: Dichlorodiphenyldichloroethylene

DDT: Dichlorodiphenyltrichloroethane

DMC: Delta Mendota Canal

EC: Electrical Conductivity

EPA: Environmental Protection Agency

FUSED: Furrow Sedimentation and Erosion computer model

GAO: General Accounting Office

HUA: Hydrologic Unit Area

L: liter

mg: milligram

ml: milliliter

NALF: Naval Auxiliary Landing Field

NASA: National Aeronautics and Space Administration

NPSP: Non Point Source Pollution

NRCS: Natural Resources Conservation Service

ppb: parts per billion

ppm: parts per million

PAM: Polyacrylamide

PCB: Polychlorinated Biphenyl compound

RCD: Resource Conservation District

SCS: Soil Conservation Service

TSS: Total Suspended Solids

U.C.: University of California

USDA: United States Department of Agriculture

VFS: Vegetative Filter Strip

WQIP: Water Quality Incentive Program

ABSTRACT

Previous studies have shown toxic levels of pesticides in agricultural drainage water entering the San Joaquin River. The West Stanislaus Resource Conservation District was awarded a grant by the California State Water Resources Control Board to measure the effectiveness of various Best Management Practices (BMPs) in reducing this pollutant load. The site of this three year project was the Crows Landing Naval Auxiliary Landing Field which contains sixteen fields of diverse size and encompasses 1,122 agricultural acres. The location of the base allowed it to be used as a BMP display and educational model for area farmers and other interested parties. In addition to analyses made during the regular irrigation seasons, supplementary samples were taken during several major storms and during polymer field trials. While all of the practices studied had the ability to decrease the movement of sediment and most pesticides to some degree, the most effective structural management tool was the use of a large sediment basin which collected runoff from all of the fields. Situated at the irrigation water exit point from the Base, along the course of its length, this sump was able to lower sediment outflows by 81% and pesticide concentrations to below detection limits during the normal irrigation seasons. The utilization of multiple BMPs in combination with each other provides the most effective control of both pesticide and sediment movement.

CROWS LANDING 319 DEMONSTRATION PROJECT

INTRODUCTION

Western Stanislaus County has been cited in the California Water Quality Assessment as contributing excessive amounts of sediment and associated pesticides to the San Joaquin River. In addition, studies conducted by the California Regional Water Quality Control Board and the U.S. Geological Survey have indicated toxic levels of soluble pesticides in agricultural drain water entering the river and elevated levels of total organochlorine pesticides in the bed sediment [4]. The source of contamination is thought to be the off-site movement of constituents in the agricultural tailwater produced while using currently accepted irrigation practices and pesticide application methods. In response to the sediment pollution concern, the U.S. Navy and the USDA Soil Conservation Service (now the Natural Resources Conservation Service or NRCS) entered into a three year agreement to determine the amount of sediment coming off leased agricultural fields at the Crows Landing Naval Auxiliary Landing Field (NALF) in Western Stanislaus County. The original project focused on controlling total sediment load and did not study the issue of chemical contamination [16].

With the award of a federal 319(h) grant, the original agreement was expanded to address chemical contamination and to allow the use of the NALF (referred to as the base) as a demonstration project to help educate growers on the use of best management practices (BMPs) in controlling the off-site movement of sediment and the potentially associated pesticides. BMPs are a method, or combination of methods, used with the intent to reduce, or prevent, nonpoint source pollution (NPSP) originating from cropland [24]. NPSP is the loading of both organic and non-organic materials into water channels from multiple and diffuse sources which impact the beneficial uses of the receiving water. The methods used to accomplish this control may be managerial, vegetative and/or structural. (Refer to Appendix A: Description of Best Management Practices) [11, 18]. This study was to monitor the effectiveness of various BMPs in reducing the amount of pollutants (both sediment and pesticides) leaving the base and eventually reaching the San Joaquin River. The pesticides of most concern and often used on the base were organochlorines (readily adsorbed to sediment) and organophosphates and carbamates (classified as soluble pesticides). In addition, the project also complimented the concurrent Western Stanislaus Hydrologic Unit Area Project (HUA) which is encouraging the use of BMPs to reduce overall sedimentation in the area [10].

The accessibility of the NALF and its operation as a "closed" system, with known water supplies and one major outfall, made the base a unique demonstration site for grower education on the use of BMPs for sediment and pesticide reduction. Crops grown on the outlease property at the base were typical of those grown throughout Western Stanislaus County and the same management techniques were used to grow them. The BMPs demonstrated during this study are directly applicable to the immediate Western Stanislaus area and to most irrigated acreage in the Western San Joaquin Valley.

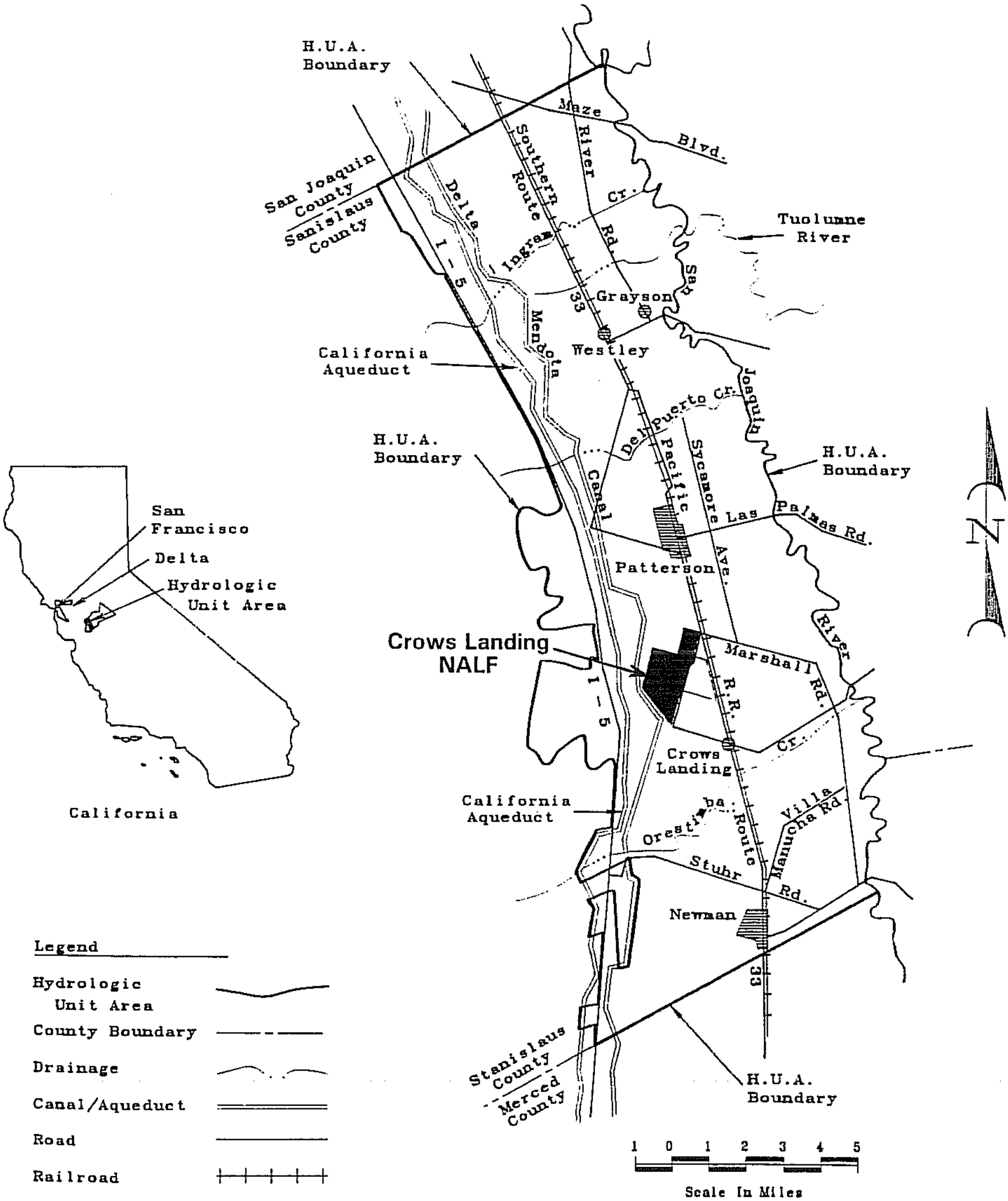
Information was disseminated throughout the course of the project through various means. Tours of the demonstration site were given to local individuals and groups, legislators and staff from various governmental agencies ranging from local to international levels. The project was referred to in meetings, workshops and conferences both locally and nationally. The board of directors of the West Stanislaus Resource Conservation District (RCD) is comprised of respected area leaders whose daily interactions in the community further serve to educate local growers. Quarterly newsletters published by U.C. Cooperative Extension specify the benefits of using various BMPs. Monthly and quarterly 319(h) progress reports were furnished to the project contract manager. (Refer to Appendix B: Transfer of Information & Technology).

On June 30, 1994 the State Water Resources Control Board amended the existing grant to allow a time extension for completion of the project. The expiration date of the agreement was changed from December 31, 1994 to June 30, 1995. The extension was necessary for several reasons. Due to the extended drought conditions of the previous years, with the resultant decrease in water allocations, the original lessee was financially unable to make a successful farming operation on the outlease properties and was released from his contract with the Navy. At the beginning of the 1993 season, the lease of the NALF farmlands was granted to Michelena Farms (an HUA and Water Quality Incentive Program (WQIP) participant) with an updated Outlease Conservation Plan Contract. In July of the same year, the stewardship of the base was taken over by National Aeronautics and Space Administration (NASA). These changes were unexpected and produced different water and land management practices - creating a disruption in the BMPs utilized and the ability of the project staff to monitor pesticide applications. These factors resulted in a reduction in the effectiveness of the study program for that year. Baseline data collected during the first year of the study was rendered useless and the project had to be readjusted with a more focussed effort on individual fields. Increased monitoring, sampling and evaluations were conducted in 1994 and 1995 in an attempt to recapture the opportunities which were lost during the transition period of the previous season. All available data are included in this report.

STUDY AREA

The Crows Landing Naval Auxiliary Landing Field (NALF) is located in Western Stanislaus County approximately 90 miles Southeast of San Francisco and covers portions of Sections 8, 9, 17 and 20 of Township 6 South, Range 8 East of the Mount Diablo Baseline and Meridian. It is bordered by Marshall Road to the north, Fink Road to the south, Bell Road to the east and Davis Road to the west and is accessed from Highway 33 (see Map 1: West Stanislaus County/Crows Landing NALF). The base encompasses 1,555 total acres of which 382 are used by NASA. The remaining 1,173 acres are leased

Map 1: Western Stanislaus County
Crows Landing NALF



out as agricultural property in five year increments. This property consists of sixteen irrigated fields totaling 1,122 acres, 46 acres of maintenance area and five acres of wildlife area (see Map 2: NALF Field and Sampling Site Locations). Due to different farming practices by the lessees, the field boundaries and acreages of fields 1, 2 and 3 were variable until 1993.

Construction of the Crows Landing Naval Auxiliary Landing Field was begun in July 1942 and the base was commissioned in May 1943. Starting out with a combined total of ten officers and men, by 1945, NALF personnel numbered 2345. The base was disestablished in December 1946 until it was reactivated in December 1950 with the advent of the Korean War. The NALF then remained operational until July 1993, at which time the stewardship of the base was transferred to NASA, the present tenant.

Western Stanislaus County is situated in the thermal belt of the Central San Joaquin Valley and is characterized by hot, dry summers and cool, wet winters. Average precipitation is about 10 inches and occurs between November and April. The average growing season is 250 days per year with irrigation required for most crops. More than fifty different crops are grown of which thirty-five are edible by humans. Major products include dry beans, tomatoes, nuts, apricots, melons, cauliflower, broccoli, spinach and numerous grain crops.

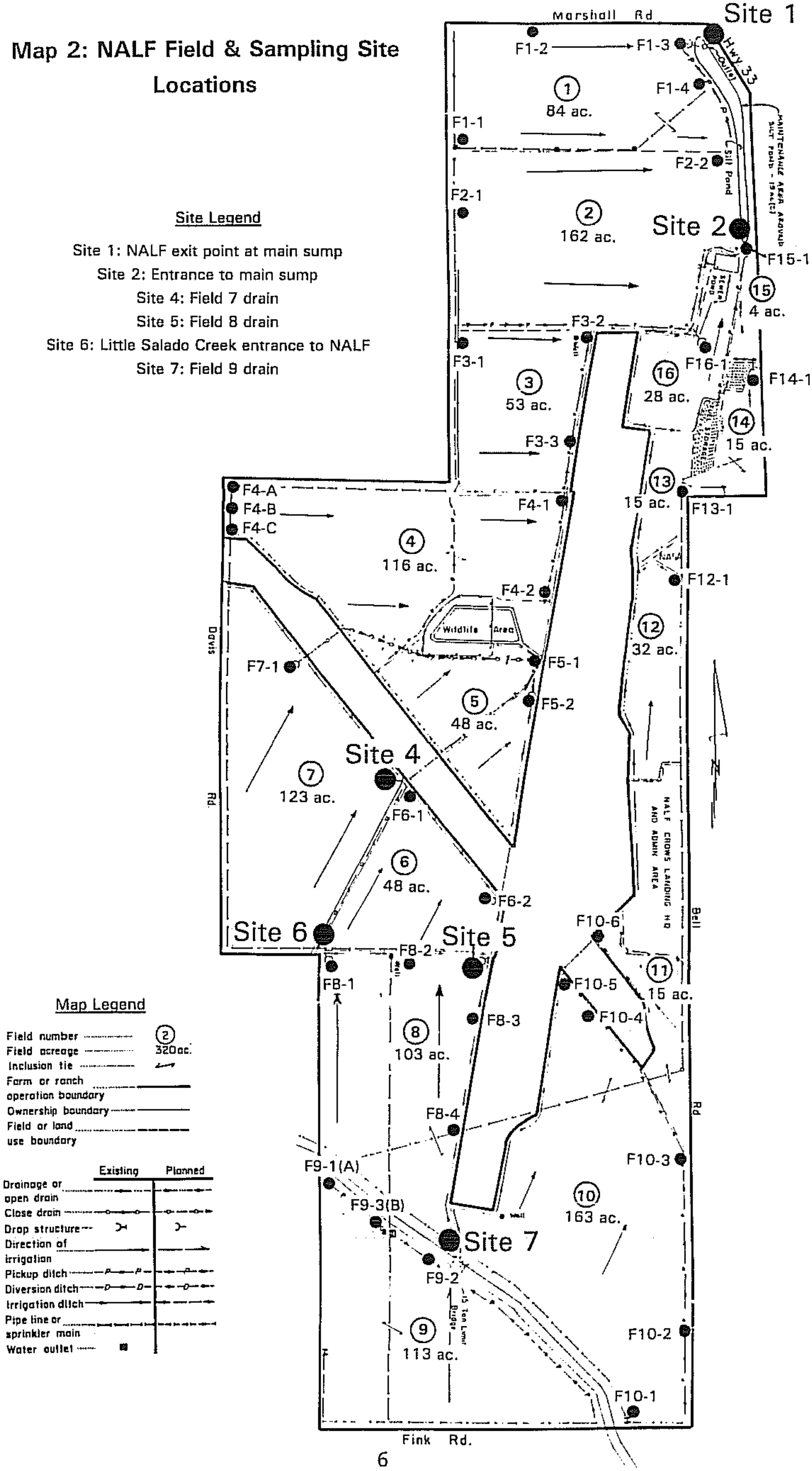
The soils on the outlease property are composed of seven current map unit types which may be grouped into three soil series: Capay clay (100 series), Vernalis (120 series) and Zacharias (140 series). These soils have few limiting factors and are classified by the USDA NRCS as Land Capability Classes I and II, nearly level, prime agricultural land. The textures of the soils found on the base are clays, clay loams and loams, are very deep and are formed by alluvial fans sloping gently eastward from the base of the Diablo Range to the San Joaquin River. They are easily compacted, have moderate to slow permeability, moderate to high water holding capacity and a slight erosion hazard under natural conditions (see Map 3: NALF Soil Types and Appendix C: Soil Capability Summary) [12].

Hydrologic groups are used in determining runoff potentials for saturated soils and are classified as either group A, B, C or D [15]. The groupings are affected by many factors including soil permeability, water intake rates, seasonally high water tables and the depth to a very slow layer of permeability. The soils on the base are composed of Group B and D type soils. Group B soils, when thoroughly wetted, have moderate infiltration rates, moderately fine to moderately coarse textures, are moderately well to well drained and have moderately low runoff potentials. Group D soils, when thoroughly wetted, have very slow infiltration rates, consist chiefly of clay soils with moderately fine to fine texture, are somewhat poorly to somewhat excessively drained and have high runoff potentials.

Map 2: NALF Field & Sampling Site Locations

Site Legend

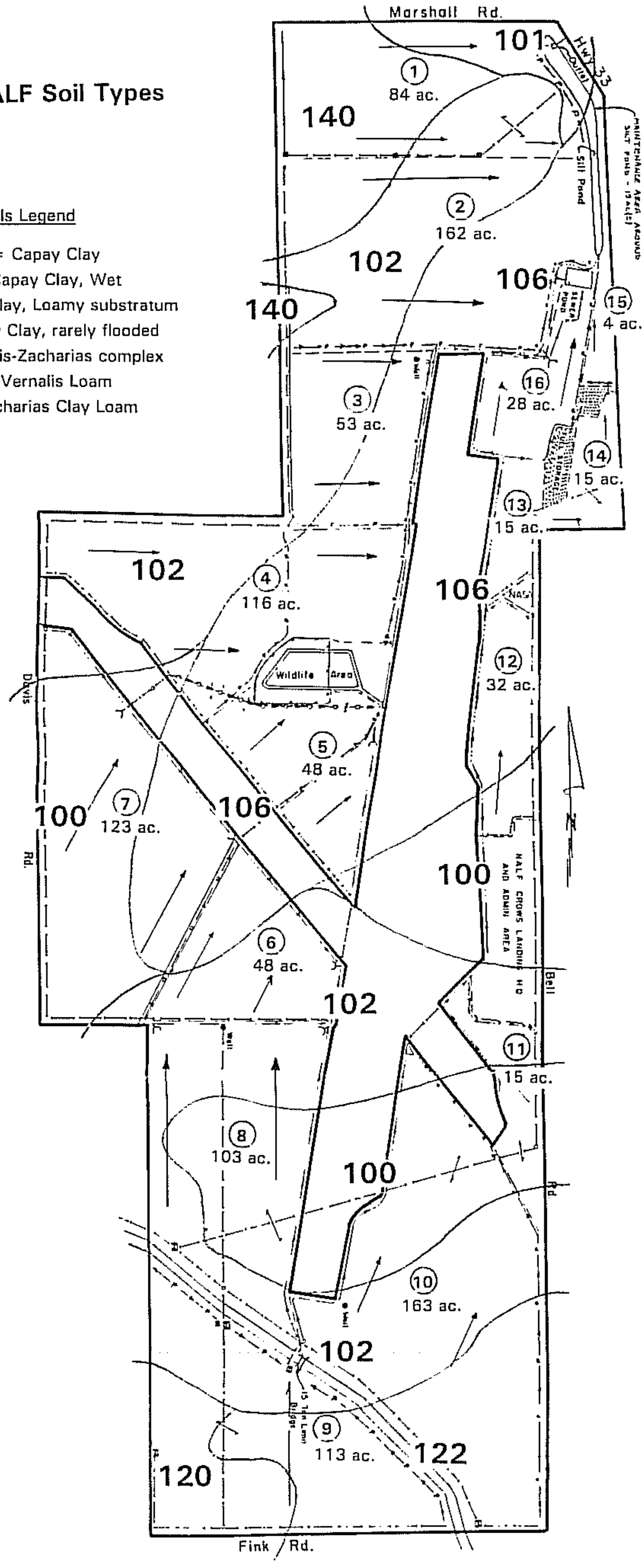
Site 1: NALF exit point at main sump
Site 2: Entrance to main sump
Site 4: Field 7 drain
Site 5: Field 8 drain
Site 6: Little Salado Creek entrance to NALF
Site 7: Field 9 drain



Map 3: NALF Soil Types

Soils Legend

100 = Capay Clay
101 = Capay Clay, Wet
102 = Capay Clay, Loamy substratum
106 = Capay Clay, rarely flooded
120 = Vernalis-Zacharias complex
122 = Vernalis Loam
140 = Zacharias Clay Loam



The NALF is an easily monitored system in that it has known water supplies and one major outfall. Irrigation water for crops is provided by three on-site deep wells and Delta Mendota Canal (DMC) water supplied by the Sunflower Water District. The wells are located on fields 3, 8 and 10. The field 3 well supplied water to fields 2 through 5. The field 8 well was inoperable until it was repaired in late July of the 1994 season. This well then supplied water to fields 6, 7 and 8. The field 10 well provided irrigation water to fields 8 and 10 through 16. Field 9 was irrigated exclusively with DMC water. A tailwater recovery system located at the main sump adjacent to field 1 provides recycled water to that field. Field 1 may also be supplied by the field 3 well but is usually irrigated exclusively with the recycled water. This return system is also capable of furnishing water to fields 2, 3 and 4 although, in 1994, it was only used three times on field 2, once on field 3 and not at all on field 4 (due to lack of operating pressure in the system). On an irregular basis during the irrigation season, water (and chemicals) may enter the NALF from up slope farmland via Little Salado Creek.

The main agricultural drain for the base is Little Salado Creek which is 11,800 feet in length from its entrance point onto the base to the main sump inlet. At its exit point from the base, Little Salado Creek empties into the Marshall Road Drain which, in turn, discharges into the San Joaquin River about 4.3 miles further East. The natural channel of Little Salado Creek has been modified and redirected with the addition of channel drops, culverts, pipelines and field sumps. The main sediment basin is located along the northeastern edge of field 1 and part of field 2 roughly parallel to Highway 33. At its entrance, the basin contains the runoff from all fields with the exception of fields 1 and 2. These two fields share a common field sump at a drainage point located at the bottom of field 1 after which the tailwater then enters the main sump. The main sump itself is 2,220 feet in length and, when cleaned, has a storage capacity of 27,300 cubic yards. Construction of this basin and its control structure was completed in October 1982. The control structure constitutes the sole exit point of water from the base where it then joins the Marshall Road Drain for eventual release into the San Joaquin River.

Appendix D: Field Histories gives a breakdown of the agricultural outlease property on the base, by field, for the years 1990 - 1994. The appendix shows field soil types and slope, annual crops and planted acreage, estimated water use and the specific chemicals applied with application dates and total amounts used. When this field information was used in conjunction with irrigations, the Goss model runoff hazard matrix and pesticide analyses of the drainage system at Site 6 (entrance of Little Salado Creek onto the base) and Site 1 (outflow of Little Salado Creek from the base into the Marshal Road Drain), it was possible to develop an overall view of the dynamics of pesticide movement on the agricultural fields.

During the years 1990 - 1992, the Western Stanislaus area was experiencing the effects of an extended period of drought conditions which resulted in a severe curtailment of Delta Mendota Canal water deliveries by the Sunflower Water District. Table 1: NALF Water Use shows actual delivery amounts to the base. This reduction made it necessary for the farmers to obtain a greater proportion of their irrigation water from on-site wells, to increase use of the tailwater return system and to use water more efficiently.

Table 1: NALF Water Use
(in acre-feet)

Year	Estimated Water Use	DMC Deliveries	% of Total Requirement	Additional Water Required
1987	ND	3904	ND	ND
1988	ND	4545	ND	ND
1989	ND	4903	ND	ND
1990	3151	2110	67	1041
1991	2126	933	44	1193
1992	1768	879	50	889
1993	1846	1393	75	453
1994	2183	1696	78	487

ND = not determined

Complete pesticide analyses of water samples was not a factor in the initial Crows Landing NALF study and with the mid-study change in lessee, it was not possible to establish a pesticide baseline from existing data. Without the baseline information, the remaining study focussed on paired fields - one with traditional management practices and the other with installed BMPs. The initial pesticide analyses for the 319(h) Project was conducted at Sites 6 and 1 on 06/10/92. The purpose behind this first sampling was to ascertain what chemicals were coming onto the property from outside sources (Site 6) and which chemicals were already existing on the fields and being transported off of them by irrigation runoff into the Marshall Road Drain (Site 1). The specific pesticides and total amounts applied per field during the course of the study are shown in Table 2: Total Pesticide Applications. Refer to Table 3: Pesticide Categories & Loss Potentials for a summary of the properties of the specific chemicals applied to the fields during the study period.

STUDY METHODS

Daily trips to the NALF along with personal observations of the demonstration fields were made by project staff to monitor all agricultural activity on the base. In order to determine the quantities of sediment, the types and amounts of pesticides and the quality of irrigation (and storm) water generated off the fields, a total of 50 organochlorine analyses, 49 organophosphate analyses, 33 carbamate analyses, 518 total suspended solid (TSS) samples and 183 electrical conductivity (EC) readings were determined. To meet the objectives of the study, water sampling locations were chosen which presented an overall view of the

Table 2: Total Pesticide Applications

Field #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Total
1992																	
Asana (p)	74	-	26	-	-	-	-	-	-	-	-	-	-	-	-	-	100 p
Comite (q)	-	-	-	120	-	-	-	-	-	-	-	-	-	-	-	-	120 q
Dicofol (p)	-	-	-	360	-	-	-	-	-	-	-	-	-	-	-	-	360 p
Dimethoate (p)	-	-	-	176	-	-	-	-	-	-	-	-	-	-	-	-	176 p
Lannate (#)	110	-	40	-	-	-	-	-	-	-	-	-	-	-	-	-	150 #
Lorsban (p)	-	-	-	-	-	-	-	-	-	-	-	32	16	16	4	28	96 p
MCPA (p)	-	160	-	-	-	-	120	-	-	-	16	-	-	-	-	-	296 p
Monitor (p)	-	-	-	-	108	108	-	-	224	320	-	-	-	-	-	-	760 p
Orthene (#)	-	-	-	60	-	-	-	-	-	-	-	-	-	-	-	-	60 #
Sulfur (#)	4000	-	2120	-	-	-	-	-	4520	6520	-	-	-	-	-	-	17,160 #
1993																	
Comite (q)	84	-	53	116	48	48	-	-	-	163	-	-	-	-	-	-	512 q
2,4-D Amine (p)	84	-	53	-	-	-	-	-	-	-	-	-	-	-	-	-	137 p
Dicofol (p)	-	-	-	-	-	-	-	-	-	326	-	-	-	-	-	-	326 p
Dimethoate (p)	-	-	-	-	-	-	-	-	-	326	-	-	-	-	-	-	326 p
Lannate (#)	-	-	-	-	-	-	-	-	-	109	-	-	-	-	-	-	109 #
Sonalan (p)	-	-	-	-	-	-	-	-	-	489	-	-	-	-	-	-	489 p
1994																	
Comite (q)	168	-	-	-	-	-	-	-	-	163	-	-	-	-	-	56	387 q
2,4-D Amine (p)	168	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	168 p
Dicofol (p)	-	513	-	209	-	-	492	430	-	320	-	-	-	-	-	-	1,964 p
Dimethoate (p)	-	297	-	104	-	-	408	215	-	160	-	-	-	-	-	-	1,184 p
Lannate (#)	-	-	18	-	-	-	62	-	57	-	-	-	-	-	-	-	136 #
Lorsban (p)	-	-	-	-	-	-	-	-	-	-	-	-	15	15	8	28	66 p
Orthene (#)	-	-	-	-	-	-	164	-	-	212	-	-	-	-	-	-	376 #
Sonalan (p)	-	486	-	348	-	-	-	206	-	489	-	-	-	-	-	-	1,529 p

Three Year Total

Asana	100 pints
Comite	1,019 quarts
2,4-D Amine	305 pints
Dicofol (OC)	2,650 pints
Dimethoate (OP)	1,686 pints
Lannate (C)	395 pounds
Lorsban (OP)	162 pints
MCPA	296 pints
Monitor (OP)	760 pints
Orthene (OP)	436 pounds
Sonalan	2,018 pints
Sulfur	17,160 pounds

p = pints of formulated product
q = quarts of formulated product
# = pounds of formulated product

(C) = carbamate
(OC) = organochlorine
(OP) = organophosphate

Table 3: Pesticide Categories & Loss Potentials
of chemicals applied to NALF fields

Trade Name	Common Name	Category	Surface Loss Potential	Leaching Potential
Herbicides				
Sonalan	Ethalfluralin	Dinitroaniline	L	S
Weed Killer 66	2,4-D Amine	Phenoxy compound	M	M
Weedar	MCPA Salt	Phenoxy compound	S	L
Insecticides				
Asana	Esfenvalerate	Synthetic Pyrethroid	L	S
Comite	Propargite	Sulfite ester	L	S
Cygon	Dimethoate	Organophosphate	S	M
Kelthane	Dicofol	Organochloride	L	S
Lannate	Methomyl	Carbamate	S	M
Lorsban	Chlorpyrifos	Organophosphate	L	S
Monitor	Methamidophos	Organophosphate	M	S
Orthene	Acephate	Organophosphate	S	S
Sulfur	Sulfur	Element	S	S

L = high probability of loss
M = possibility of loss
S = very low probability of loss

water flow dynamics of the base. The entrance and exit locations of Little Salado Creek, along with a sampling site located at the entrance to the main sump, quantified the loading of pesticides and sediment which occurred. (See Map 2: NALF Field & Sampling Site Locations and Appendix E: Yearly Field & Sampling Site Analyses for the specific analyses performed at each site).

The original study plan intended that water volume flow determinations at both the entrance (Site 6) and exit (Site 1) points of the base be continuously recorded during the period of study. Measurement of inflow volumes at Site 6 were impractical due to the physical characteristics of the site and the fact that there was rarely any flow onto the base during the normal irrigation season. Outflow volumes at Site 1 had been collected during the previous study with a Handar 570A Data Collection Platform (DCP) and associated hardware beginning with the 1990 irrigation season. The conductivity sensor box was inundated with flood waters during March 1991 storms. In April of the same year, a fire was set in the outlet structure and rendered the remaining equipment inoperable. The damaged components were replaced and operation of the system resumed in June 1991. Unfortunately, the internal electrical hardware of the DCP never operated correctly again. During 1991 and 1992, data was collected but obviously incorrect data was recorded every six hours. During the first week of July in 1992, it was discovered that data could not be down-loaded from the system and this problem was never resolved. With the absence of volume flow information, it was not possible to determine the volume of tailwater pesticide loads exiting the base and it was necessary to focus upon pesticide concentrations at specific sites. For a synopsis of the data collected when water was leaving the base, see Table 4: DCP Volumes At Site 1.

Table 4: DCP Volumes At Site 1
(in acre-feet)

Sampling period	**06/27-09/06 1990**	**06/27-08/22 1991**	**04/21-07/05 1992**
Number of Days with Outflow	69	16	66
Total Outflow	327.21	41.52	176.6

In addition, certain fields were selected each year as areas of special comparison study due to specific BMPs in use, crops being grown or pesticides to be applied. Some fields were chosen for their use of alternative irrigation methods as a comparison to standard agricultural practices. A typical field would be furrow irrigated by siphon pipes with the water coming from earthen supply ditches and the tailwater being collected and carried to the outlet by earthen drainage ditches. The fields chosen due to their plantings were generally those with row crops such as dry lima beans and tomatoes which, historically, tend to produce high amounts of sediment and water runoff due to irrigation requirements and the multiple cultivations usually performed on them. Previous studies have shown that cereal grain and hay crops such as wheat, oats and alfalfa usually produce minimal amounts of erosion [9]. (See Appendix F: Average TSS Production by Crop). The fields selected for study and the crops grown during the project are listed in Table 5: Crops In Monitored Fields.

The original Crows Landing NALF study in conjunction with the Navy was conducted to determine the amount of total suspended solids (TSS) and the quantity and general quality of the water leaving the base. The emphasis of the 319(h) study was to determine the pesticide concentrations applied to and exiting the base, to ascertain the most effective BMPs in preventing the departure of both sediment and pesticides and to utilize the agricultural fields on the base as an educational demonstration area.

During the course of the 319(h) project, electrical conductivity (EC) data was collected in order to measure the concentration of dissolved electrolytes (salts) in irrigation water as a measure of general water quality.

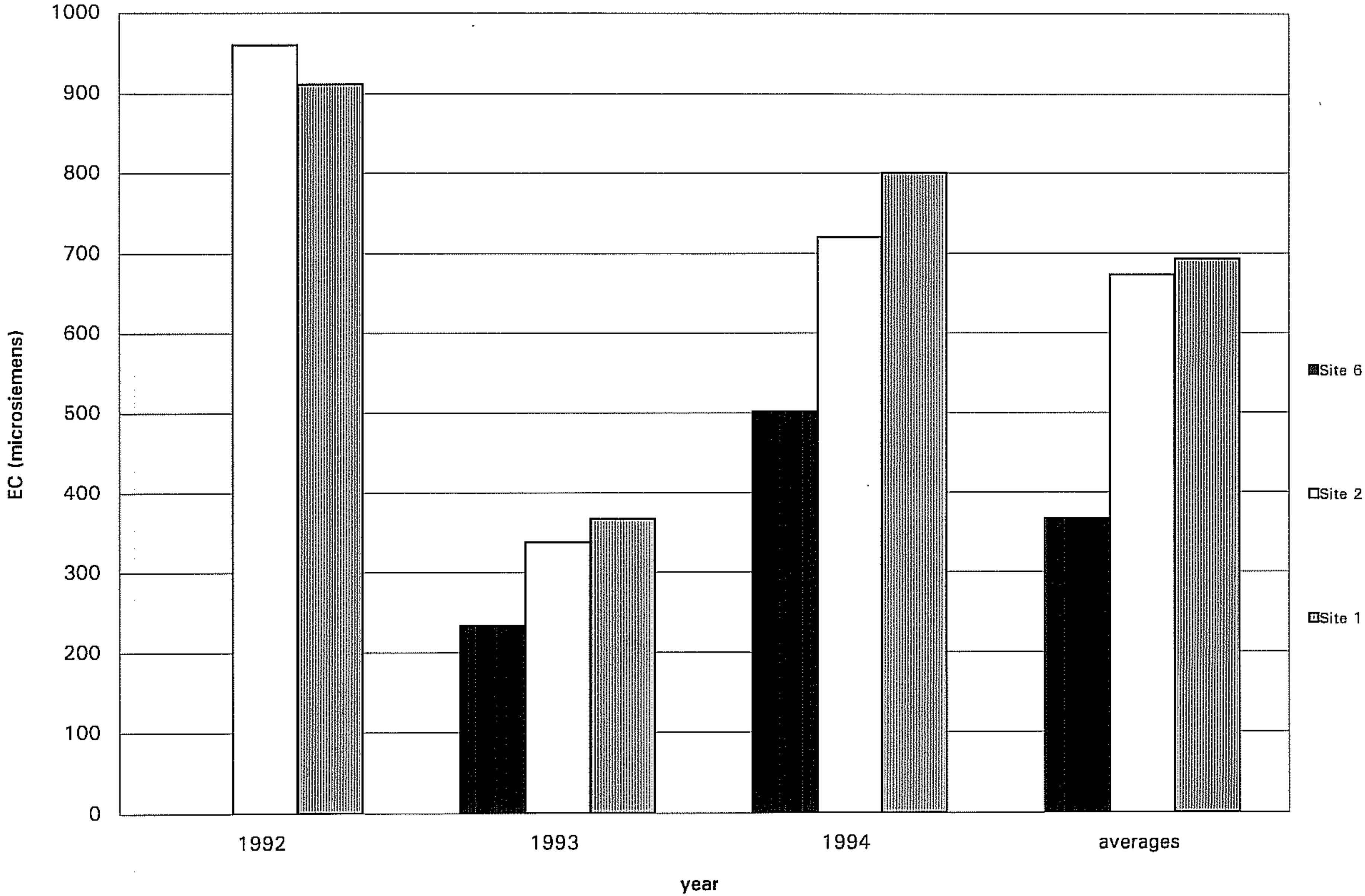
Table 5: Crops In Monitored Fields

Field	1992	1993	1994
1	**Tomatoes**	Corn	**Corn**
4	Dry Limas	Corn	**Dry Limas**
6	Tomatoes	**Corn**	Oats/Corn
7	Wheat	Wheat	**Green Beans**
9	Tomatoes	Alfalfa	**Alfalfa**
10	Tomatoes	**Dry Limas**	**Dry Limas**

During the 1992 season, readings were taken for sixty days at Site 1 (base outflow point) using a Beckman SoluMeter and a Handar 570A Data Collection Platform. Handar Model 540 hardware and DCP software were used to process this data. The remainder of the 1992 EC data was taken using a portable Myron L Company Agri-Meter. Readings in 1993 and 1994 were taken using the Agri-Meter exclusively. Samples were collected in one pint polyethylene bottles at the pre-determined sampling sites. Additional readings were taken from the Delta Mendota Canal, Patterson tap water and distilled water (for calibration purposes). (Refer to Appendix G: Electrical Conductivity Data, Appendix H: Quality Assurance Project Plan and Graph 1: EC Averages: Sites 6, 2 &1).

Total suspended solids (TSS) samples were collected in conjunction with irrigation schedules at predetermined field and drainage sites. The timing of TSS sample collections was based upon irrigation scheduling. (Refer to Appendix I: Irrigations & Cultivations). Several TSS determinations were also made during major storm runoffs. The collections were taken with one pint polyethylene bottles which were rinsed with sample water three times before the final filling. Efforts were made to submerge the bottles a minimum of 0.5 feet beneath the surface or, as was often the case with shallow field runoffs, as deeply as possible. The bottles were filled and capped while in the water. If the TSS determinations were not to be performed the day of collection, the samples were refrigerated. Samples were periodically randomly retested to corroborate the results with less than a 10% difference in results considered acceptable. TSS concentrations were determined at the USDA-NRCS Field Office laboratory in Patterson using Standard Practice for Determining Suspended Sediment Concentration in Water Samples, ASTM Designation: D3977-80, Wet Sieve Filtration Method [1]. The resulting concentrations were based upon the sediment mass contained in the samples [3, 5]. (See Appendix J: Total Suspended Solids and Appendix K: Average TSS Leaving Fields).

Graph 1: EC Averages: Sites 6, 2 and 1



FUSED (Furrow Sedimentation and Erosion) is a USDA-NRCS computer model used to predict the furrow irrigation-induced sediment rates produced on a particular field by different crops in a crop rotation. It allows for the exploration of the effects of alternative conservation practices and irrigation techniques. The data entries for this program included field dimensions, agronomic, managerial and cultivation practices and soils information. Using this model, it was possible to predict the amounts of potential sediment production in a site-specific manner. The results obtained from this program were used for purposes of comparison with actual TSS results. Appendices L and M show the possible yearly sediment loss by crop and field which might be anticipated without the benefit of BMPs according to the FUSED model.

The most common classes of pesticides applied to the NALF fields were organophosphates, carbamates and organochlorines [6]. Refer to Appendix N: Pesticide Properties for a list of the chemicals applied to base fields. Organophosphates and carbamates are water soluble and move in irrigation water. Organochlorines have the tendency to attach to sediment particles and are transported by irrigation induced erosion. Because of this potential chemical movement, it was possible that undesirable quantities of pesticides were leaving the base. The 319(h) project was initiated to determine what quantities of chemicals were actually involved and which management practices were the most effective in reducing this total amount.

Before the start of pesticide sampling, it was first necessary to find a laboratory which had the capabilities and skills necessary to perform the required analyses. After contacting the California Regional Water Quality Control Board and the Department of Health Services concerning accredited analytical laboratories, the NRCS District Conservationist and the 319(h) Project Technician visited several laboratories in Stanislaus County. On June 11, 1992, they toured one facility and returned satisfied with the laboratory's organization and capabilities. For chemical analyses, this laboratory used EPA method 608 for organochlorine detections, EPA method 622 for organophosphates and EPA method 632 for carbamate analyses. As a result, the West Stanislaus Resource Conservation District Board of Directors and the 319(h) Project Contract Manager approved a sub-contract with GeoAnalytical Laboratories, Inc. of Modesto, CA.

In collecting samples for pesticide analyses, a standardized methodology was established. Sampling procedures were conducted in accordance with EPA and Regional Board guidelines. (Refer to Appendix H: Quality Assurance Project Plan). Appropriately sized solvent rinsed glass amber bottles were obtained from the analyzing laboratory. The bottles were then taken to the selected sampling locations, submerged 0.5 feet beneath the surface, uncapped, filled and recapped while still immersed. Attempts were made to minimize the amount of air bubbles allowed into the containers. The completed samples were then stored on ice and transferred to the laboratory within 24 hours. Ten percent of the total number of samples supplied to the laboratory were replicate (blind) samples. The replicates were used to assess the validity of the results obtained from the laboratory. In addition, reagent spike recovery rates were provided by the laboratory to verify the accuracy of their data. Quality control results with an 80 to 120 percent recovery rate were considered acceptable.

Water samples were tested for total organochlorines and PCBs (EPA Method 608), total organophosphates (EPA Method 622) and total carbamates (EPA Method 632) depending upon the specific chemicals applied to the study fields. Pesticides were extracted from water-borne sediment using organic solvents and were identified and quantified by gas chromatography using electron capture and thermal ionic specific detectors. Analytical reference standards were used to match peaks on the chromatographs. (Refer to Appendix O: Analytical Results: Field & Sampling Sites for actual pesticide detections).

The timing of pesticide analyses was based on pesticide applications and irrigation schedules obtained from base personnel, the farm manager, and the Stanislaus County Agricultural Commissioner's District Office in Patterson (Appendix D: Field Histories and Appendix I: Irrigations & Cultivations). Additional sampling and analyses were made during winter storm events.

Soil surface runoff and leaching hazard potentials for the pesticides applied to each field were determined using the Goss model which was developed by Don Goss and is part of the NRCS Field Office Technical Guide. This tool uses a NRCS pesticide data base and a soil unit ratings system to determine the probability of chemical runoff into surface water and leaching into groundwater supplies. Surface runoff and leaching potentials are determined separately. The result is a pesticide-soil interaction rating of 1, 2 or 3. These ratings are combined in a Goss model matrix to give the potential loss which might occur when a specific pesticide is used on a specific soil [17, 19-23].

A Potential 1 pesticide has a high probability of loss by surface runoff or leaching. Its use should be strongly evaluated to ensure that no risks are posed to animals or humans. If possible, an alternate pesticide or different pest management methods should be used. A Potential 2 pesticide has a possibility of loss though not as large as that of a Potential 1 compound. Use of a Potential 2 pesticide should also be assessed by site-specific criteria and other chemicals and management techniques considered. A Potential 3 pesticide has a very low probability of loss and presents a minimal hazard to water resources if used according to label instructions. For a breakdown by individual field and chemical hazard potentials applicable to each field, see Appendix P: Goss Model Pesticide Hazard Potentials.

In reviewing the individual application sites for the Goss model determination, field slope and soil types were taken into account. When the slope was 2% or less, the soil surface loss potential was reduced. This determinant was applied to all fields evaluated in this study. Under flood or furrow irrigation, water dispersible clays, aggregate stability and diminished permeability increase soil surface loss potentials from nominal to intermediate [15]. In this study, the potentials were increased for fields 1, 2, 3, 9 and 10, all of which have Vernalis and/or Zacharias soil types (Map 3: NALF Soil Types and Appendix Q: NALF Soil Properties & Ratings).

The primary use of the NALF is for military activities. The agricultural lease operation is secondary and subject to the military requirements for the land. Typical crops grown on the base included dry beans, alfalfa, tomatoes, sugar beets and small grains. Vineyards, orchards, rice and sod farming were prohibited. The lessee was required to notify base personnel in advance of chemical application types, rates and methods. Due to the fact that the agricultural lands at the NALF are leased out in five year increments, continuity of crop rotations on the base is rather uncertain at best. Different farmers tend to concentrate on certain crops more heavily than others. For example, Farmer A might have a large investment in equipment for growing and harvesting sugar beets while Farmer B's machinery is intended for the production of tomatoes. The actual crop rotations during this study may be seen in Table 6: NALF Field/Crop Histories. In addition, the upkeep of a rental property is not always a top priority of the renter. Therefore, to alleviate this type of abuse, the NALF lease contract was modified by the NRCS to contain several mandatory conservation provisions consistent with the objectives of the Hydrologic Unit Area Project (HUA).

Table 6: NALF Field/Crop Histories

Field	1992	1993	1994	Acreage
1	Tomatoes (100A)	Silage Corn	Silage Corn	84
2	Wheat (146A)	Wheat	Dry Beans	162
3	Tomatoes	Silage Corn	Alfalfa	53
4	Dry Beans	Silage Corn	Dry Beans	116
5	Tomatoes	Silage Corn	Oats/Fallow	48
6	Tomatoes	Oats/Silage Corn	Oats/Silage Corn	48
7	Wheat	Wheat	Green Beans	123
8	Sugar Beets (40A)	Silage Corn	Dry Beans	103
9	Tomatoes	Alfalfa	Alfalfa	113
10	Tomatoes	Dry Beans	Dry Beans	163
11	Wheat	Oats	Oats/Fallow	15
12	Alfalfa	Alfalfa	Alfalfa/Fallow	32
13	Alfalfa	Alfalfa	Alfalfa/Fallow	15
14	Alfalfa	Alfalfa	Alfalfa/Fallow	15
15	Alfalfa	Alfalfa	Silage Corn	4
16	Alfalfa	Alfalfa	Silage Corn	28

BEST MANAGEMENT PRACTICES (BMPs)

The contract agreement with the Navy obligated the farmer to utilize, or install, and correctly maintain specific BMPs to control soil loss and maintain productivity. These included:

- Overall irrigation water management (annually).
- Use of a tailwater recovery system located between field 1 and the main sump (annually).
- Use of tailwater ditch tarps when the flow paralleled the row direction (annually).
- Use of the main sediment basin (annually).
- Crop rotations (annually).
- Minimum tillage/cultivation operations (annually).
- Land levelling (when necessary).
- Installation of a vegetative filter strip on a field to be determined during the lease period. (Due to changeover of lessee, this was not installed until the 1994 season on field 1).

An extended compilation which shows the actual BMPs used in the fields is given in Appendix R: BMP Use Histories. In addition, the tenant was also required to plant a cereal grain or hay crop in each field at least once during the five year lease period with all of the crop residues being reincorporated into the soil. During the first two years of their lease (1993, 1994), Michelena Farms accomplished this in all fields with the exception of field number 10. Crop rotations involve the production of different crops on a specific field in a specified sequence and normally run in 2-8 year cycles. Rotations are used in row crop farming to maintain, or improve, the physical soil condition, protect the soil during high erosion periods and to control weeds, insects and plant diseases while, at the same time, produce a favorable economic return for the farmer. Plantings are formulated to alternate between erosive and non-erosion causing crops. Locally, normal rotations usually include small grain crops for soil stabilization and legume crops for nitrogen fixation. A typical rotation scheme for the Western Stanislaus area is shown in Table 7: Typical Western Stanislaus Crop Rotation.

Table 7: Typical Western Stanislaus Crop Rotation

Year	Summer	Winter
1	Tomatoes	Cauliflower
2	Dry Beans	Fallow
3	Dry Beans	establish Alfalfa
4	Alfalfa	Alfalfa
5	Alfalfa	Alfalfa
6	Alfalfa	Alfalfa
7	Alfalfa	Winter Oats

FOCUS FIELDS

A normal irrigation of row crops would entail the application of water into furrows through the use of siphon pipes. During the project, certain fields were chosen each year for more intensive monitoring due to the particular BMPs being utilized, pesticides used or crop being grown. Field 1 (in tomatoes) was focussed on in 1992 due to the use of irrigation water supplied by a tailwater recovery system. Field 10 (in dry lima beans) was studied in 1993 due to its possession of a field sump. In 1994, several fields were studied. Field 1 (in silage corn) was chosen for its use of the tailwater recovery system and the fact that a vegetative filter strip was located along a portion of its lower end. The location of this filter strip allowed for comparisons between BMP use and standard (non-BMP) use on the same field. Fields 4 and 9 are very similar in total acreage. They were selected in 1994 to evaluate the differences between crops and irrigation application methods. Field 4 was in dry lima beans and was furrow irrigated with siphon pipe. Field 9 was in alfalfa and was flood irrigated with gated pipe. Field 7 (in green beans) was also focussed on during the 1994 season because irrigation water was applied to its top portion with gated pipe and to its lower portion with siphon pipe. A yearly list of the BMPs present in the special focus fields is shown in Table 8: BMPs In Monitored Fields. The BMPs focussed on are in bold type.

Field 1 was selected in 1992 due to its use of the tailwater recovery system. On 07/25, Dicofol (an organochlorine) and Dimethoate (an organophosphate) were applied to field 4. During an irrigation on 08/05, organochlorine and organophosphate analyses were made on samples taken at the southern field 4 drain to determine if those chemicals were leaving the field and entering the drainage system. Field 1 was also being irrigated on that day and the tailwater recovery system was in use. Field 1 tailwater was sampled to check if there was a secondary contamination of that field by chemicals from field 4 through use of the tailwater return system. When compared to data from the collection point at the field 4 drain, field 1 samples showed reductions in the amounts of p,p'-DDE, p,p'-DDT, Toxaphene and Dimethoate while p,p'-DDD was below the detection limit. Aldrin was detected in field 1 tailwater but not in field 4 water.

On 07/14/93, field 10 tailwater was analyzed at the entrance and exit points of the field sump. This was done to illustrate the effectiveness of the sump in reducing pesticide movement. Dicofol and Dimethoate had been applied to the field on 07/14. The tailwater was tested for organochlorine and organophosphate residues and TSS concentrations. Analytical results indicate that the field sump was effective in reducing p,p'-DDE and p,p'-DDT. Dimethoate, however, showed an increase at the sump exit although both entrance and exit concentrations were at, or just above, the detection limit for that particular pesticide.

In 1994, fields 1, 4, 7, 9 and 10 were selected for pesticide analyses. Field 1 was chosen because of the installation of a vegetative filter strip (VFS) situated along a portion of its lower edge. The presence of both a filter strip and a standard area on the same field allowed for a convenient comparison of BMP pesticide

Table 8: BMPs In Monitored Fields

Field	1992	1993	1994
1	Crop rotation Cutback stream irrigation Field sump Furrow length reduction Gated pipe TW Ditch tarps **TW Recovery system**	not monitored	Field sump Furrow length reduction TW Ditch tarps **TW Recovery system** **Vegetative filter strip**
4	not monitored	not monitored	Crop rotation Furrow length reduction Horseshoe drains TW Ditch tarps
6	not monitored	Crop rotation Horseshoe drains **PAM Polymer Trials**	not monitored
7	not monitored	not monitored	Crop rotation Furrow length reduction **Gated pipe** Horseshoe drains TW Ditch tarps
9	not monitored	not monitored	Field sump Gated pipe
10	not monitored	Crop rotation **Field sump**	Field sump Furrow length reduction TW Ditch tarps **PAM Polymer Trial**

TW = Tailwater

and sediment reduction effectiveness. Irrigation was with recovery system water delivered by siphon pipe. Standard portion and pre-emergence filter strip source and tailwater samples were taken to establish a baseline on 06/17 and 06/20. Analyses were made for organochlorines, organophosphates, carbamates and TSS concentrations. No pesticides were detected on the first sampling date while p,p'-DDE and p,p'-DDT were found in the source water for the second set of samples but not in the outflow. On 07/13, organochlorine analyses were conducted on source and tailwater samples of the standard field segment and no detections were made. TSS concentration were also determined. It was intended for an organochlorine analyses to be made on the emerging vegetative filter strip (VFS) portion of the field on 07/15 while that portion was being irrigated but the filter strip was submerged from a backup of water at the field sump for three days. Additional source and tailwater samples were taken on 08/12 (standard) and 08/15 (established VFS) for organochlorine and organophosphate analyses. Dimethoate was found in the source water and both tailwater samples with the vegetative filter strip specimen having a lower concentration. That particular sample also revealed the presence of Methoxychlor at its detection limit.

In 1994, field 9 was planted in alfalfa and was irrigated with gated pipe. Organochlorine, organophosphate, carbamate and TSS concentration analyses were conducted on field 9 source (DMC) and runoff waters on 07/11/94 to determine the efficiency of alfalfa in reducing the movement of pesticides in a field. The canal water produced no detections while the tailwater samples showed p,p'-DDT at its detection limit.

In 1994, field 4 was planted with dry lima beans and was irrigated with siphon pipes. Dicofol and Dimethoate were applied to the field on 07/11/94. On 07/15, organochlorine, organophosphate and TSS concentration analyses were conducted on source water and tailwater samples both as a follow-up on analyses made on 08/05/92 and as a comparison to field 9 which is similar in size but was planted in alfalfa and utilized gated pipe to to supply irrigation water. Methoxychlor and Dimethoate were discovered in the field 4 tailwater samples taken at the primary field drain. In keeping with the testing done two years previously, field 1 tailwater was analyzed for organochlorine and TSS concentrations on 07/13 with no resultant pesticide detections.

Field 7 was chosen for intensive study in 1994 because the farmer was using gated pipe to supply water to the top portion of the field and siphon pipe for the lower part. Dicofol and Dimethoate were applied to the field on 07/19. Source and tailwater samples were taken on 08/10 for organochlorine, organophosphate, carbamate and TSS concentration analyses. p,p'-DDE, p,p'-DDT and Dimethoate were detected at the main field drain. Dimethoate was used on the field on 08/24. Organochlorine, organophosphate and TSS concentration analyses of gated pipe runoff at the primary field drain were analyzed on 08/29. Identical analyses were performed on siphon pipe tailwater at the field drain on 08/31. The same pesticide residues were also detected although in different concentrations. On 09/09, irrigation was being done simultaneously with gated and siphon pipe. Organochlorine, organophosphate and TSS concentration analyses were performed on siphon pipe source water and both sets of tailwater. The siphon pipe source water had no detections. Tailwater samples from both gated and siphon pipe yielded p,p'-DDE and p,p'-DDT in equal quantities. In addition, Dimethoate was detected in the gated pipe runoff.

<u>BMPs & SEDIMENT CONTROL</u>

Both the original NALF study and the 319(h) Project included determinations of TSS and EC in irrigation tailwater at selected sites. When utilized and maintained correctly, all of the Best Management Practices used on the demonstration site had the potential to reduce the total amount of sediment being generated off the fields [16]. In reality, however, this was not always the case. Yearly values for inflow to the base (Site 6), at the entrance to the main sump (Site 2) and outflow from the base (Site 1) are shown in Table 9: Five Year Drainage System TSS & EC Averages. The increased reliance on deep well and recovery system water seems to have produced additional salinity in the irrigation water.

Table 9: Five Year Drainage System TSS & EC Averages
(concentrations in ppm)

Year	1990	1991	1992	1993	1994	Average Per Year
<u>Site 6</u>						
TSS	242 (7)	225 (7)	65 (9)	100 (11)	62 (12)	139
EC	ND	ND	ND	233 (11)	501 (6)	367
<u>Site 2</u>						
TSS	248 (9)	492 (10)	616 (10)	329 (7)	533 (16)	444
EC	ND	ND	960 (1)	338 (7)	720 (6)	673
<u>Site 1</u>						
TSS	26 (9)	56 (11)	200 (16)	144 (20)	100 (43)	105
EC	1300 (95)	1327 (42)	1059 (68)	367 (19)	800 (35)	971

ND = not determined (#) = number of samples

Crop rotations with alfalfa were very effective in sediment reduction because the crop acted as a vegetative filter and dramatically reduced sedimentation from individual fields. Wheat and oats are irrigated a minimal number of times. The tailwater produced from those fields, if any, had relatively low TSS content with an average of 177 ppm. In effect, the runoff water from these crops diluted the higher sediment load tailwater produced by row crops which had a TSS average of 2090 ppm (a 92% reduction). This effect resulted in a per volume reduction of sediment concentrations exiting the base.

The tailwater recovery system (used primarily on field 1 and several times on fields 2 and 3) allowed for the reuse of irrigation tailwater. It can be concluded that all tailwater leaving the base is actually excess (unnecessary) water applied to the fields. In theory, the return system provided the potential for zero water outflow into the Marshall Road Drain. With no water leaving the base, no pesticides would leave either and the San Joaquin River would not be impacted. In actuality, of course, this did not occur. Analysis of 1994 data of tailwater leaving the base at Site 1 when the return system was in use revealed an 11% average increase in TSS concentration. This is understandable since water with an existing sediment load, when applied to a field, will naturally acquire additional sediment during further irrigation with that water. The vegetative filter strip planted on a portion of the bottom end of field 1 performed well despite adverse growing conditions. The strip was planted on 06/08/94, was severely washed out by diverted field 2 tailwater on 06/20-21 and started to (sparsely) emerge on 06/26. In addition to frequent field 2 tailwater diversions, the filter strip was also subjected to flooding from backups of tailwater at the field sump on four later occasions. Despite these problems, the strip managed to reduce tailwater TSS by an average of 90% when contrasted with the non-vegetative filter strip part of the field.

Gated pipe does not appear to be an effective BMP in reducing TSS levels when used solely at the top end of a field. When compared to siphon pipe supply water loads, gated pipe produced tailwater with 4% higher concentrations of TSS. The design of gated pipe allows it to be placed in mid-field with runoff water from the top of the field flowing underneath it. This lessens the amount of water required to irrigate the remainder of the field and reduces the need for mid-field tailwater ditches - thus increasing arable acreage, increasing the yield and reducing labor costs.

The field sumps, when correctly maintained, performed fairly well in the removal of sediment. Data available for the field 10 sump shows a three year average TSS reduction of 39%. Due to its large size, storage capacity and efficiency, the main sump was the most important BMP on the base in effectively removing sediment in that it served the total agricultural drainage area. During the regular irrigation seasons, use of the main sump produced an average 70% TSS reduction between its inlet (Site 2) and outlet (Site 1) during the course of the study. A three year TSS average of 148 ppm exiting the base at Site 1 during the normal irrigation season easily met the recommended limit of 300 mg/L (see Appendix S: Main Sump Efficiency in Sediment Reduction). In contrast to the three year average field runoff sediment total of 1483 ppm, the effectiveness of the complete base drainage system for sediment reduction is evident (see Graph 2: TSS Averages: Sites 6, 2 and 1). Refer to Table 10: BMP TSS Reduction Averages for a summary of BMP sediment reduction effectiveness in fields focussed on during the project.

Actual TSS results from the fields showed tomatoes, dry lima beans and green beans to be the most erosive crops grown at the demonstration site. TSS predictions obtained from the FUSED computer model, however, listed the most erosive crops in order as: green beans, dry lima beans and tomatoes.

PESTICIDE MOVEMENT

The amount of organic matter in a soil is a major factor in determining the amount of sorption (attachment) of pesticides to soil particles. Pesticides adsorbed to sediment near the soil surface may move from the site of application through irrigation runoff. The K factor is a measure of possible pesticide/soil particle detachment and transport. Appendix C: Soil Capability Summary and Appendix Q: NALF Soil Properties & Ratings give a breakdown of these important soil components.

Graph 2: TSS Averages: Sites 6, 2 and 1

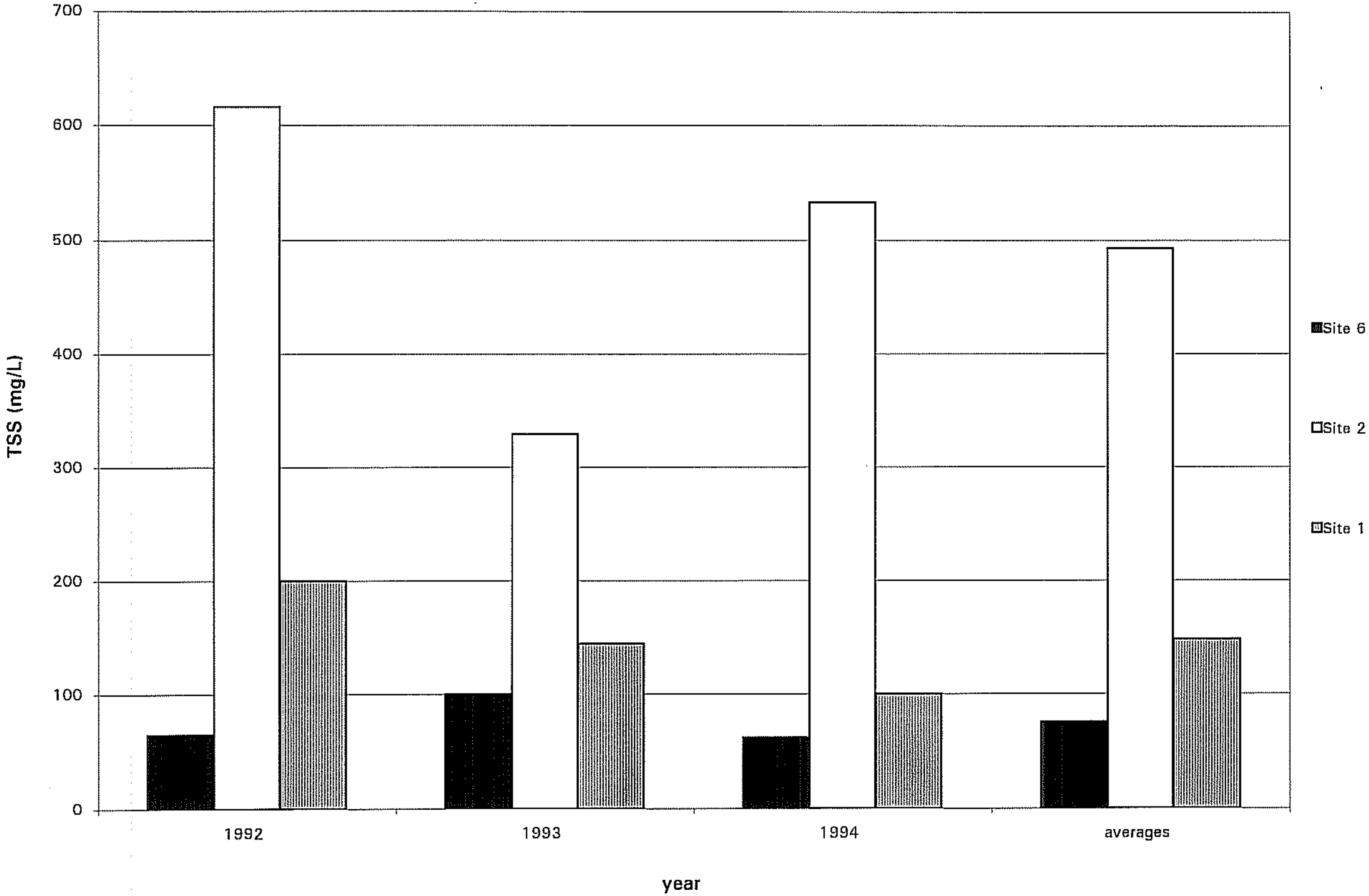


Table 10: BMP TSS Reduction Averages
(concentrations in ppm)

BMP Evaluated	BMP Field	BMP Crop	Control Field	Control Crop	Average Source TSS	Average BMP TSS	Average Control TSS	Average TSS % Reduction
Cropping Sequence	9	Alfalfa	4	Beans, dry lima	98 (F9) 50 (F4)	91	2172	96%
Field Sump	10	Beans, dry lima	none	none	sump in 6430	sump out 570	-	91%
Gated Pipe	7	Beans, green	7	Beans, green	18 (gated) 220 (siphon)	2778	2673	(4%)
Main Sump	Site 1	-	Site 2	-	-	148 (S1)	493 (S2)	70%
Recovery System	1	Tomatoes	4	Beans, dry lima	ND	ND	ND	ND (11%) 1994
Vegetative Filter Strip	1	Corn, silage	1	Corn, silage	203	242	2409	90%

(%) = % increase ND = not determined - = not applicable

After a pesticide is applied to the soil, its behavior is dependent on two major properties: its solubility and persistence. The solubility is given in parts per million (ppm) and is the amount of the pesticide's active ingredient which will dissolve in water at room temperature. The strength of a pesticide's attachment to soil particles, by either physical or chemical means, is measured by its Koc value (or soil sorption index). In general, the solubility and Koc values of a pesticide are inversely related. If the solubility is high, the pesticide will not adhere to surface soil and will tend to leach through the soil. If its Koc value is high, the pesticide will tend to attach more readily to soil and move only when there is sediment runoff. The persistence of a pesticide determines how long it will remain in the environment. Persistence is usually measured in terms of half-life - the number of days until the concentration of the active ingredient is reduced by 50%. Factors affecting half-lives include pesticide volatility, temperature, soil moisture, microbial populations and their activity, timing of cultivation and irrigation practices after application and the method of pesticide application. See Appendix N: Pesticide Properties for the solubility, sorption and persistence values of the specific chemicals used on Project fields during the course of the study. Also refer to Graph 3: Organochlorine/TSS Correlations which shows the relationships between organochlorine and sediment concentrations in tailwater.

The Goss model was used to determine the probabilities for pesticide runoff into surface water by the specific chemicals used on the fields. Pesticide analyses were taken during irrigation cycles in conjunction with recent chemical applications and with consideration of the runoff potentials of the particular chemicals used. Attempts were made to test the proficiency of different BMPs and crops in reducing the concentration of chemicals leaving both individual fields and the entire outlease property as a whole.

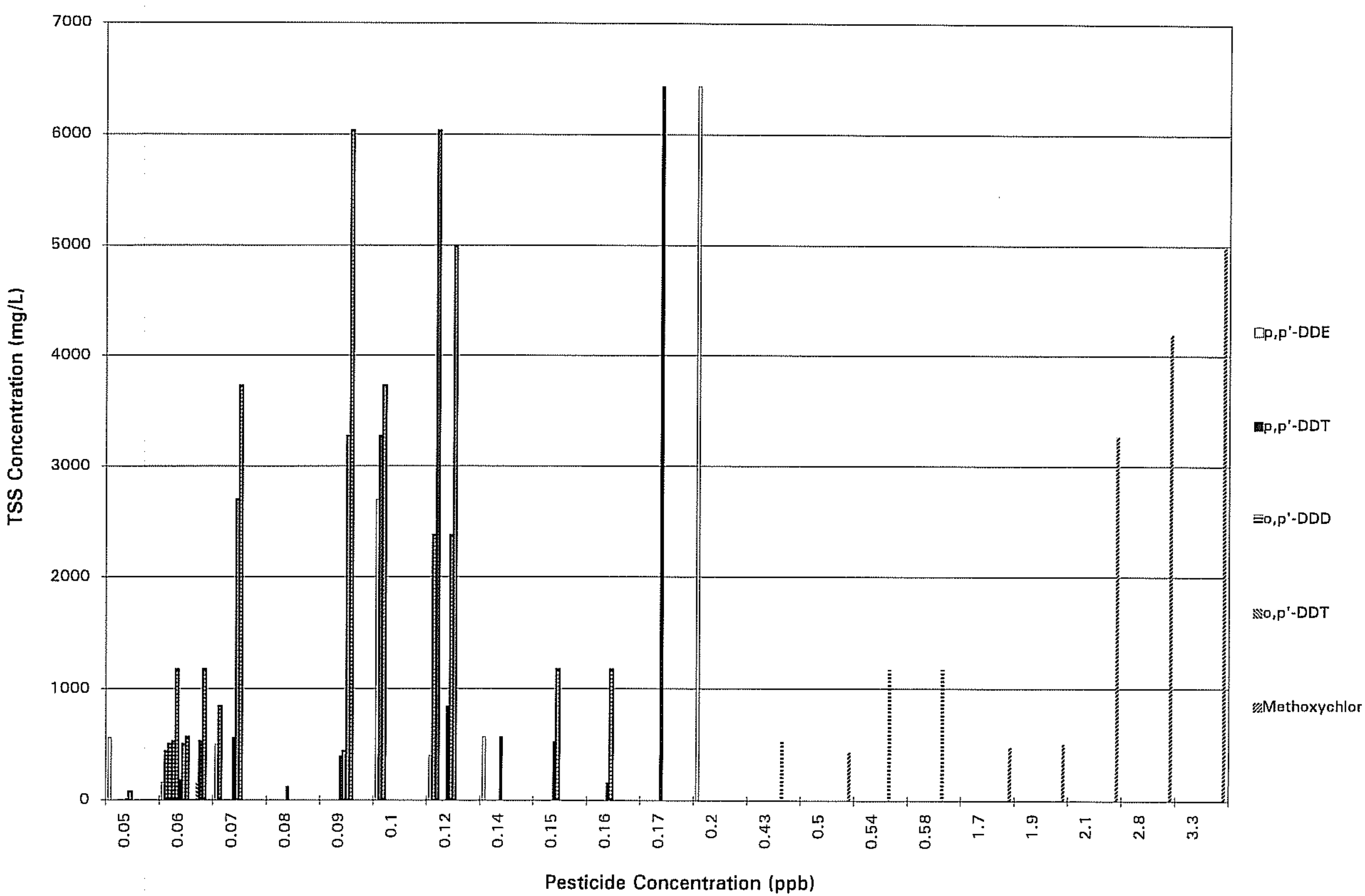
BMPs & PESTICIDE CONTROL - IRRIGATION SEASON

During the regular irrigation season, the abilities of the monitored BMPs to diminish pesticide movement were quite varied. In 1992, analysis of field 1 tailwater, which was supplied by the tailwater recovery system, showed 50% lower concentrations of p,p'-DDE and p,p'-DDT, a 33% lower concentration of Toxaphene and a 55% lower concentration of Dimethoate than field 4 tailwater analyses revealed. The reduced amounts may have been from dilution of the tailwater or from sediment with attached pesticides settling out of suspension somewhere in the base drainage system. The pesticides may also have remained on field 1 after application by the tailwater return system. In this same manner, the analytical results indicate that the recovery system might actually introduce chemicals onto untreated fields. In this instance, Aldrin was either already present on field 1 or it was picked up at some point in the drainage system and deposited by the recycled water. No analyses were made on field 1 source water to determine what levels of pesticides were being applied to the field by the irrigation water itself.

In the analysis of the field 10 sump efficiency, when compared to tailwater entering the sump, tailwater leaving the sump showed a reduction of p,p'-DDE by 30% and p,p'-DDT by 18%. Dimethoate, on the other hand, showed a 10% increase in concentration. By the time the irrigation water reached the main sump outfall, p,p'-DDE concentration decreased an additional 57%, p,p'-DDT declined another 43% and Dimethoate showed a 55% reduction. This may be accounted for by dilution or by the sediment settling out of suspension. Field sumps show the capacity to effectively reduce the transport of pesticides by irrigation water.

In 1994, analyses on field 1 tailwater in August, when the vegetative filter strip was well established, produced verification of that particular BMP's effectiveness in retaining chemicals on a field. Return system source water showed a Dimethoate concentration of 3.7 ppb while the standard section tailwater data indicated a concentration of 4.1 ppb. The VFS portion had a Dimethoate concentration of 1.7 ppb - a reduction of 59% when compared to the "normal" runoff part of the field. This points to the effectiveness

Graph 3: Organochlorine/TSS Correlations



of a vegetative filter strip in capturing chemicals on the field and preventing their movement off of the property. Analysis of tailwater return system data indicates that the recycling of water may result in increased organochlorine movement, higher EC readings and increased TSS values on the applied field due to the recovery system water's higher initial sediment content. It is also possible that secondary contaminations occurred by chemicals introduced from other fields. The recycling of tailwater on-site did reduce eventual off-site impacts to the San Joaquin River.

Field 7 analyses in 1994 produced some ambiguous results. With whole field drainage at the main field drain, gated pipe lowered p,p'-DDE concentrations by 29%, p,p'-DDT by 47% and Dimethoate levels by 22% when compared with siphon pipe drainage. These results suggest that gated pipe may be an useful tool in supplying irrigation water in order to decrease pesticide movement. In partial field drainage at respective tailwater ditches, however, p,p'-DDE and p,p'-DDT concentrations were identical between gated and siphon pipe applications. Dimethoate was three times its detection limit in gated pipe runoff and was not detected in the siphon pipe tailwater. The effectiveness of gated pipe in the reduction of chemical movement might be further increased if it were also used to supply water in mid-field applications. Overall, the results obtained from the gated pipe analyses were inconclusive. The tailwater ditch tarps in field 7, however, appeared to be an effective means to trap organochlorine laden sediment, allowing it to settle out of suspension, decreasing its introduction into the main drainage system and, thereby, preventing its exit from the base.

In comparing pesticide detection concentrations between the entrance to the main sump (Site 2) and the main sump exit point (Site 1), it appears that the main sump performs as an efficient BMP in decreasing the amount of pesticides that leave the base during the irrigation season. (Refer to Table 11: Main Sump Pesticide Reduction Efficiency). Natural chemical decomposition, aeration and the dilution of pesticide concentrations by irrigation water must also be considered as additional factors in this reduction. There were no organophosphate detections during these comparative samplings.

BMPs & PESTICIDE CONTROL - STORM EVENTS

During the course of the study, the majority of the monitoring was conducted during the normal irrigation season, April through September. However, several pesticide and TSS analyses were made on water samples taken during two major storm events on 01/13/93 and 01/10/95. Additional attempts were made to sample in 1995 but either storm flow was minimal or, as in one case, access to the base was impractical due to severe flooding in the area. Storm analyses were done to compare the results between rainfall and man-made irrigation runoff. It was assumed that the effects of uncontrolled water application and runoff might produce different pesticide residue detections and concentrations than those found during normal irrigation cycles. With the exception of field sumps and the main sump, no structural or managerial BMPs

Table 11: Main Sump Pesticide Reduction Efficiency

Pesticide	Detection Limit (ppb)	Date	Site 2 Concentration	Site 2 Replicate	Site 1 Concentration	Site 1 Replicate	Reduction %
p,p'-DDE (OC)	0.05	06/22/94	0.06	0.07	ND	-	23% +
p,p'-DDE (OC)	0.05	01/10/95 (se)	0.06	-	ND	0.06	0 - 17% +
p,p'-DDT (OC)	0.05	06/22/94	ND	0.06	ND	-	0 - 17% +
p,p'-DDT (OC)	0.05	01/10/95 (se)	0.15	-	0.15	0.16	0 - (7% +)
Methoxychlor (OC)	0.5	06/22/94	1.7	1.9	ND	-	72% +
o,p'-DDT (OC)	0.05	01/10/95 (se)	0.06	-	0.06	ND	0 - 17% +
o,p'-DDD (OC)	0.05	01/10/95 (se)	0.43	-	0.54	0.58	(30%)
Diuron (C)	1.0	01/10/95 (se)	8.0	-	6.5	5.9	23%

ND = not detected
- = not analyzed

(OC) = organochlorine
(C) = carbamate

(se) = storm event
(%) = percent increase

were in use during storm samplings. Vegetative BMPs, such as crops of winter wheat and dormant stands of alfalfa were present in some fields. The chemical concentrations found are listed in Table 12: Storm Analysis Detections. Non-detections (ND) were used for comparison purposes.

No organophosphates were detected in either of the two storm analyses. During the 1995 storm event, blind duplicate samples were taken at Site 1. In this instance, as anticipated, unimpeded storm runoffs did result in the appearance of two previously undetected chemicals - o,p'-DDD and o,p'-DDT isomers. It was interesting to note that the concentrations of the isomers entering the base at Site 6 during the storm were, for all intents and purposes, the same concentrations leaving the property at Site 1. The levels of Diuron detected during the 1995 storm, however, showed a concentration increase from point of entry to point of exit. Due to the malfunctioning of the Data Collection Platform, no volume outflows from the base were determined. It was previously hypothesized that chemicals were entering the base from upslope farming operations and this was borne out by the presence of Diuron during the 1993 storm and previously undetected o,p'-DDT at Site 6 during the 1995 storm event. Even during uncontrolled storm runoffs, the main sump reduced pesticide concentrations in most cases. The only exception was found in the 1995 storm analyses in which the o,p'-DDD level increased by 30% between Site 2 and Site 1. The TSS readings taken at Site 1 during the two storm events far exceeded the desired limit with an average of 940 ppm.

Table 12: Storm Analysis Detections

Sample Date	01/13/93		01/10/95	
Site 1				
p,p'-DDE	ND		ND (0.06)	
p,p'-DDT	ND	TSS: 710	0.15 (0.16)	TSS: 1,170
o,p'-DDT	ND	EC: NA	0.06 (ND)	EC: 192
o,p'-DDD	ND		0.54 (0.58)	
Diuron	7.3 (6.8)		6.5 (5.9)	
Site 2				
p,p'-DDE			0.06	
p,p'-DDT			0.15	TSS: 526
o,p'-DDT	not analyzed		0.06	EC: 192
o,p'-DDD			0.43	
Diuron			8.0	
Site 6				
p,p'-DDE	ND		0.06	
p,p'-DDT	ND	TSS: 3,940	0.16	TSS: 158
o,p'-DDT	ND	EC: NA	0.06	EC: 192
Diuron	3.1		11.0	

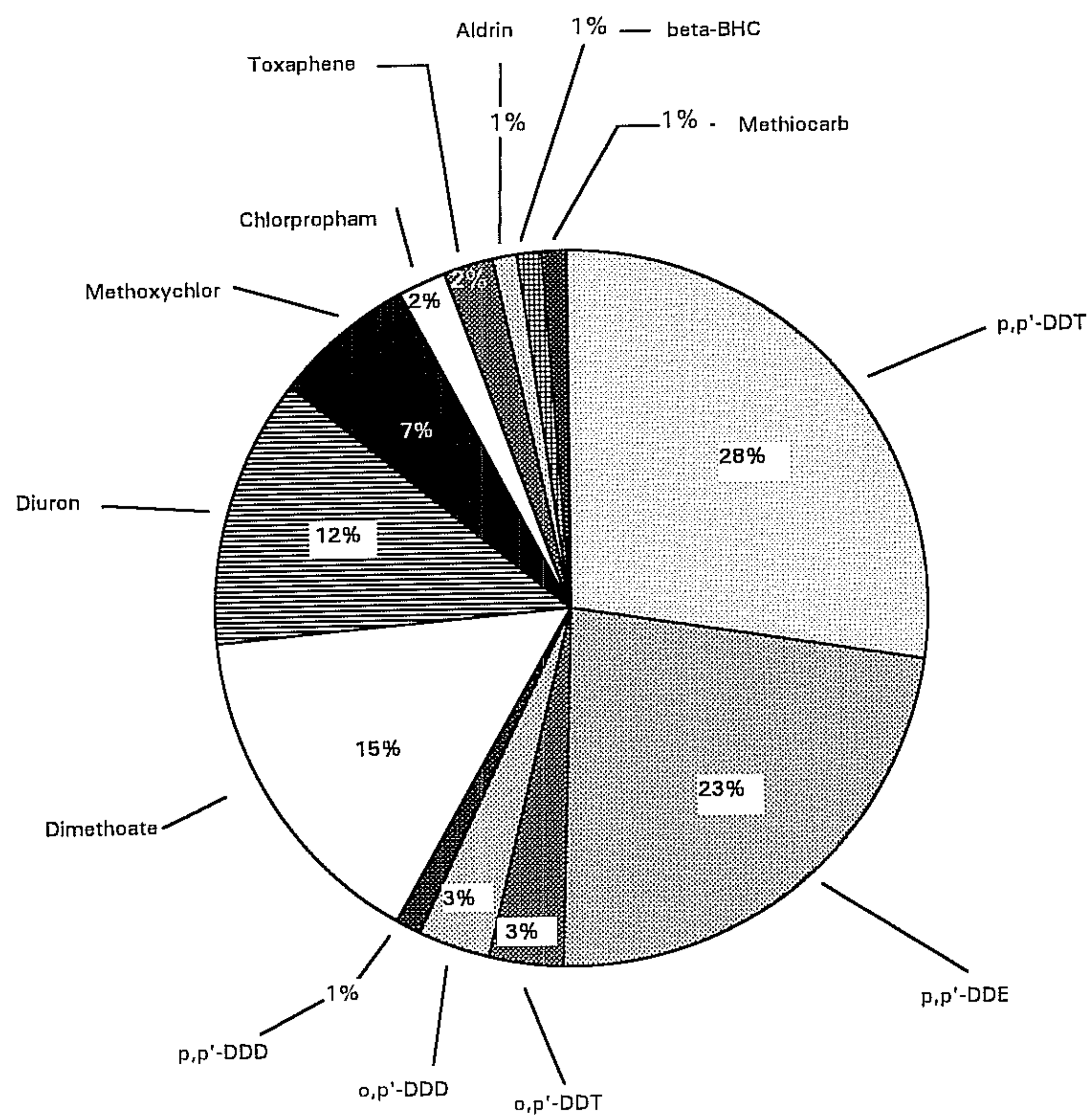
NA = not analyzed ND = not detected

The pesticide analyses made during the 1995 storm event yielded 24.5% of all DDTr detections (the sum of all residues from DDT and related compounds) obtained during the study. Taken as a whole, DDTr residues themselves made up 58.2% of the total analytical detections. DDT has been banned since 1973. The two storm analyses also produced 63.6% of all Diuron detections. Storm samples comprised 15.2% of the total number sent to GeoAnalytical Laboratories and also contained 15.2% of all chemical residue detections. Refer to Graph 4: Pesticide Detection Percentages for a visual representation of all detections during the course of the study.

NEW TECHNOLOGIES

University of California Cooperative Extension Service personnel conducted several polyacrylamide (PAM) polymer field trials on the base during the course of this study. Polyacrylamides are synthetic polymers, or long chains of molecules, which, in agricultural applications generally have a slightly anionic (negative)

Graph 4: Pesticide Detection Percentages



charge which gives them the ability to attract soil particles in the irrigation water. It has been discovered that these molecules have the potential to maintain aggregate stability, improve irrigation water infiltration, flocculate suspended soil particles out of solution and, thereby, drastically reduce tailwater runoff and erosion [2].

PAM for agriculture usually comes in a fine granular form similar in size to table sugar crystals. It is necessary to mix it very well with the irrigation water to prevent premature formation of a flocculate. This is accomplished through the use of a "Gandy box" mixing apparatus or, if sufficient turbulence is present, the water itself may suffice. A recent product developed by Allied Colloids called a Soilfix Powerblock is a 4" compressed cube of the polymer which is placed in the supply water flow allowing for a gradual release of the compound onto the field. This new product is still in the experimental stage and, so far, a limited number of field trials have been performed with it in this area.

PAM has been registered in California by the Department of Food and Agriculture as a soil amendment although there are still questions concerning long-term effects on aquatic organisms. An interim standard has been approved by the NRCS and polymer use may become eligible for cost-sharing in agriculture. The field trials were made to determine the amount of polymer needed to produce the most effective reduction in sediment runoff and to test the ability of the polymer to control the off-site movement of chemicals, Dicofol in particular. Dicofol (Kelthane) is used extensively in the West Stanislaus area on beans in particular. Dicofol is manufactured from DDE (which contains DDT as a manufacturing by-product) and may be a more recent source of both DDT and DDE in the environment. By 1987, the manufacturer of Kelthane had reduced the sum of DDTr to less than 0.1% [7]. Although the use of DDT was banned in 1973, its residues are still very much in evidence. Pesticide and TSS analyses were performed by 319(h) Project staff during several of the PAM trials.

In 1993, water samples from field 6 (planted in silage corn and irrigated with siphon pipe) were taken on 06/02 and 06/03 during polymer trials being conducted by the University of California Cooperative Extension Service. Analyses were made for organochlorines, organophosphates, carbamates and TSS concentrations to determine the effectiveness of two different polymers in the reduction of TSS and chemical residue runoff from the field. No pesticides had been applied to the field since the previous year. On 06/02, Soilfix G1 polymer was applied at a rate of 1 ppm, the rate of water application was 20 gpm and the tested furrow length was 500 feet. Analytical results showed no detections in the source water, detections of p,p'-DDE and p,p'-DDT in the control (untreated) water, no trace of p,p'-DDE and a reduction in the amount of p,p'-DDT in the polymer treated water. On 06/03, Soilfix 21J polymer was used with identical concentration, water application and furrow lengths. Analytical results from the second trial revealed p,p'-DDT at the detection limit in the source water, p,p'-DDE and p,p'-DDT in the control tailwater, no trace of p,p'-DDE and a reduction in the concentration of p,p'-DDT in the treated runoff.

During the 1993 polymer trials in field 6, compared to untreated (control) tailwater, polymer treated water on June 02 decreased p,p'-DDE to below detection and reduced the concentration of p,p'-DDT by 50%. On June 03, a different polymer reduced the p,p'-DDE concentration in treated water to below detection and lowered the p,p'-DDT concentration by 11% when compared to control water. In this trial, p,p'-DDT was also detected in the source water. While control furrow water had an 80% increase in p,p'-DDT as compared to source water, the treated furrow tailwater had only a 60% concentration increase. It appears that the application of polymers during agricultural irrigations does hold promise in reducing the off-site movement of both pesticides and sediment.

Field 10, planted in dry lima beans, was sprayed with Dicofol and Dimethoate on 06/14/94. U.C. Cooperative Extension and U.C. Riverside personnel ran a Soilfix G1 polymer trial on 06/23 to test the effectiveness of the polymer in reducing the amount of Kelthane (Dicofol) movement and TSS field runoff and to check the ability of the polymer to increase the water infiltration rate in treated furrows. The polymer concentration was 5 ppm, furrow length was 600 feet and the water was applied at 15 gpm by siphon pipe. Organochlorine, organophosphate, carbamate and TSS concentration analyses were performed on source, control and treated furrows. The source water had no detections while both of the tailwater sample analyses produced p,p'-DDT and Methoxychlor. The polymer treatment furrow also yielded a p,p'-DDE detection.

In the 1994 field 10 polymer trial analysis, compared to control water, polymer treated irrigation water showed an increase in p,p'-DDE concentration from under the detection limit to just over the limit of 0.05 ppb. On the other hand, the treated runoff had concentration decreases of 25% for p,p'-DDT and 36% for Methoxychlor. The increase in DDE concentration may have been due to a higher existing concentration in the treatment furrow. Polymer did appear to help in the control of the other detected chemicals. It should be considered that the detection of pesticides in field samples may produce inconclusive results since the collections are subject to uncontrollable factors due to the nature of the sampling environment itself. The pesticide analysis results obtained during polymer testing by 319(h) Project staff are listed in Appendix T: Analytical Results: PAM Polymer Trials.

With polymer concentrations ranging from 1 ppm to 5 ppm, TSS levels in polymer treated furrows were reduced between 34% and 92% when compared to the runoff of untreated furrows at their respective collection points (refer to Table 13: PAM Polymer TSS Reduction Percentages). The results generally tended to be in the higher percentage range. Pesticide analyses results, however, were not quite as dramatic. In general, p,p'-DDE, p,p'-DDT and Methoxychlor showed concentration decreases in the polymer treated water with reductions ranging from 11% to 50%. In one case, however, p,p'-DDE (with a detection limit of 0.05 ppb) was undetected in the control (untreated) water sample while the treated sample had a concentration of 0.10 ppb.

Table 13: PAM Polymer TSS Reduction Percentages
(concentrations in ppm)

Polymer Evaluated	Trial Field	Field Crop	Irrigation Method	Source TSS	Treatment TSS	Control TSS	Reduction %
Soilfix G1	6	Corn, silage	furrow/ siphon	93	186	2370	92%
Soilfix 21J	6	Corn, silage	furrow/ siphon	72	126	434	71%
Soilfix G1	10	Beans, dry lima	furrow/ siphon	67	3270	4985	34%

(%) = % increase

U.C. Riverside conducted three polymer field trials on field 10 in 1994 - a background test before planting during the pre-irrigation, one during the first irrigation and another during the final irrigation for the season. Although the field had not yet been sprayed with Kelthane that season, analytical results from the first (pre-irrigation) trial showed residual amounts of the pesticide. Polymer treated furrows yielded Kelthane concentrations approximately 50% less than the control furrows. The second trial (first irrigation) was conducted after a surface application of Kelthane on 06/14/94. Treatment furrow samples produced Kelthane concentrations of 1.76 grams/hectare (gm/ha) while control furrow concentrations were 2.61 gm/ha - a 33% reduction. Of the total pesticide material applied to the field, 0.14% left the field in runoff water from the treated furrows while 0.24% left in the control furrow tailwater. With the application of the polymer to the treated furrows, Kelthane was bound to the soil surface by the polymer. Increased water infiltration and a decreased volume of tailwater runoff was recorded. By the time of the third trial (last irrigation), the field had been cultivated and during the irrigation the polymer was strongly adsorbed to the soil particles. Kelthane treatment furrow concentration was 0.23 gm/ha while control furrow concentration was 0.86 gm/ha - a 73% reduction. Of the total chemical applied, percentages of the pesticide leaving the field in runoff water was 0.021% for the treated furrows and 0.076% for the control furrows. [8].

During the polymer testing in Field 10 on 06/23/94, a limited single species 96 hour bio-assay (EPA Method LC50) analysis was performed by GeoAnalytical Laboratories on source, control and treatment water samples taken during the trial to determine the toxicity of the polymer to Fathead Minnows (sp. Pimephales promelas). At various water sample dilutions, ranging from 25-75%, no mortalities were observed in the minnows used as indicators. If fatalities had occurred at dilution rates of 50% or more, the sample water could have been considered a "hazardous material". See Appendix U: Limited Bio-Assay PAM Polymer Results for actual results.

SUMMARY & CONCLUSIONS

The West Stanislaus Resource Conservation District was funded by the California State Water Resources Control Board to implement the Crows Landing 319(h) Demonstration Project for several reasons. The first was to compare the effectiveness of various Best Management Practices in controlling off-site chemical movement in addition to sedimentation. Secondly, the location of the Crows Landing Naval Auxiliary Landing Field made it an excellent demonstration site to educate and promote these techniques to local growers.

Specific fields were selected each year for more thorough study based upon the BMPs being utilized, the crops being grown and the particular pesticides to be applied during the growing season. Pesticide analyses were determined on surface water samples taken during irrigations following pesticide applications. In addition, total suspended solids and electrical conductivity samplings were made to determine the quality of both source water and tailwater. Surface water drainage system samples were taken during several winter storms to learn if unimpeded natural water flows would yield different quantities and/or types of pesticide detections.

According to the Goss model, the insecticide Dimethoate has a very low surface loss potential on all soil types at the NALF. It was, however, frequently detected in organophosphate analyses made shortly after field applications of the chemical. A re-evaluation of its surface loss potential might be in order.

The particular best management practices focussed on during the regular irrigation seasons all showed the capacity to reduce the movement of sediment with varying degrees of success - with the exception of gated pipe (used solely on the upper end of a field) and the tailwater recovery system (which recycled sediment on-site) both of which had slight TSS concentration increases when used (refer to Tables 9, 10 and 13). In most instances, organochlorine, organophosphate and carbamate pesticide concentrations were reduced by all of the BMPs studied. However, there were occasions when the chemical concentrations did not change or actually increased (refer to Table 11, Table 14: BMP Pesticide Reduction Efficiencies and Table 15: PAM Polymer Pesticide Reduction Efficiencies).

Table 14: BMP Pesticide Reduction Efficiencies

(concentrations in ppb)

BMP Evaluated	BMP Field	BMP Crop	Irrigation Method	Control Field	Control Crop	Irrigation Method	Pesticide Detected	Source Concentration	BMP Concentration	Control Concentration	BMP % Reduction
Cropping Sequence	9	Alfalfa	flood/ gated	4	Beans, dry lima	furrow/ siphon	p,p'-DDT (oc)	<0.05	0.05	<0.05	(25%+)
							Methoxychlor (oc)	<0.5	<0.5	2.8	82%+
							Dimethoate (op)	<0.1	<0.1	1.8	94%+
Field Sump	10	Beans, dry lima	furrow/ siphon	-	-	-		sump in	sump out		
							p,p'-DDE (oc)	0.20	0.14	-	30%
							p,p'-DDT (oc)	0.17	0.14	-	18%
							Dimethoate (op)	1.0	1.1	-	(10%)
Gated Pipe	7	Beans, green	furrow/ gated pipe	7	Beans, green	furrow/ siphon	p,p'-DDE (oc)	<0.05	0.5	0.7	29%
								<0.05	0.1	0.1	none
							p,p'-DDT (oc)	<0.05	0.07	0.12	42%
								<0.05	0.07	0.07	none
							Dimethoate (op)	<0.1	11.3 (13.4)	15.8	22%
								<0.1	0.3	<0.1	(200%+)
Main Sump	Site 1	-	-	Site 2	-	-	p,p'-DDE (oc)	-	<0.05	0.065	23%+
							p,p'-DDT (oc)	-	<0.05	0.06	0-17%+
							Methoxychlor (oc)	-	<0.5	1.8	72%
Recovery System	1	Tomatoes	furrow/ siphon	4	Beans, dry lima	furrow/ siphon	Aldrin (oc)	-	0.09	<0.05	(80%+)
							p,p'-DDE (oc)	-	0.05	0.10	50%
							p,p'-DDD (oc)	-	<0.05	0.05	20%+
							p,p'-DDT (oc)	-	0.05	0.10	50%
							Toxaphene (oc)	-	1.2	1.8	33%
							Dimethoate (op)	-	7.3	16.2	55%
Vegetative Filter Strip	1	Corn, silage	furrow/ siphon	1	Corn, silage	furrow/ siphon	Methoxychlor (oc)	<0.5	0.5	<0.5	(25%+)
							Dimethoate (op)	3.7	1.7	4.1	59%

(%) = % increase   - = not applicable   (oc) = organochlorine   (op) = organophosphate

Table 15: PAM Polymer Pesticide Reduction Efficiencies
(concentrations in ppb)

Polymer Evaluated	Trial Field	Field Crop	Irrigation Method	Pesticides Detected	Source Detection	Treatment Detection	Control Detection	Reduction %
Soilfix G1	6	Corn, silage	furrow/ siphon	p,p'-DDE (oc) p,p'-DDT (oc)	<0.05 <0.05	<0.05 0.06	0.12 0.12	58%+ 50%
Soilfix 21J	6	Corn, silage	furrow/ siphon	p,p'-DDE (oc) p,p'-DDT (oc)	<0.05 0.05	<0.05 0.08	0.06 0.09	17%+ 11%
Soilfix G1	10	Beans, dry lima	furrow/ siphon	p,p'-DDE (oc) p,p'-DDT (oc) Methoxychlor (oc)	<0.05 <0.05 <0.5	0.10 0.09 2.1	<0.05 0.12 3.3	(50%+) 25% 36%

(%) = % increase (oc) = organochlorine

BMPs such as vegetative filter strips or crop rotations with alfalfa can trap and filter out the sediment with attached pesticides (organochlorines). The combined use of BMPs such as field sumps, sediment basins, tailwater ditch tarps and polyacrylamides provide the best opportunities for the sediment (and organochlorines) to settle out of suspension. Water soluble pesticides such as organophosphates and carbamates may be contained through the utilization of BMPs which use less water (gated pipe and/or surge valve irrigation) or through the reuse of irrigation water (tailwater recovery systems). Sediment basins used in conjunction with other BMPs showed the greatest overall promise as highly effective means in reducing the movement of both pesticides and sediment. An integrated approach using structural and managerial BMPs (such as those planned in the WQIP) provided the best results in pesticide reduction.

RECOMMENDATIONS

The key practice in reaching the goal of decreased chemical and sediment movement is irrigation water management - correctly managing the flow rate, total volume and amount of time the irrigation water is applied. In other words, to effectively use the available water to meet the crops' water and nutritional needs while minimizing tailwater runoff and erosion. Positive results from this practice may include increased water distribution uniformity, better infiltration, decreased water and power use, greater chemical effectiveness and the potential for an increase in crop yields. Crop quality is not jeopardized when adequate management and monitoring is conducted. To achieve these objectives it is imperative that the irrigators be sufficiently trained and knowledgeable in the desired irrigation techniques.

Unfortunately, efficient irrigation water management is usually more labor intensive and results in increased labor costs. Farmers, like most people, generally tend to avoid factors which might negatively affect their monetary return. Fortunately, USDA cost-sharing is available for implementing many of the structural BMPs with assistance ranging from 50 - 75% of the installation costs for many of the practices. This is an important incentive in persuading local growers to adopt these methods. Participation in WQIP programs such as Irrigation Water Management and Controlled Drainage provide another source of funds for improving water quality ranging from $14 to $20 per acre. Through coordinated program delivery of water quality projects, such as the 319(h) Demonstration Project, the West Stanislaus HUA, WQIP and other locally sponsored projects, changes are occurring in the area.

Farmers realize that their management of irrigation tailwater and voluntary efforts to reduce the off-site movement of pesticides and sediment is a much more desirable alternative than enforced governmental regulations. The emerging technology of polymer use presents exciting possibilities for agriculture and the potential applications of polymers should be further investigated. The continued promotion of best management practices, along with cost-sharing incentives to mitigate installation costs, will allow for additional water quality improvements in the future.

TAB

APPENDIX A

APPENDIX A: DESCRIPTION OF BEST MANAGEMENT PRACTICES (BMPs)

Crop Rotation: A practice pertaining to irrigated row crops. Involves the rotation of erosion causing with non-erosion causing crops (such as alfalfa). Usually based on an eight to ten year cycle. In this case, the NALF five year contract agreement requires the planting of a cereal grain or hay crop at least once per field during the term of the lease.

Cutback Stream Irrigation: Use of a high initial furrow flow rate with a rate reduction when water reaches the furrow end. Reduces water use, erosion, sediment and water runnoff.

Field Sump (debris or sediment basin): Sumps are situated at the end of tailwater ditches. They are built to allow for the settling of sediment carried by irrigation runoff water. The basin should be long and narrow to provide ample time for the sediment to drop out of solution. To ensure correct operation, it is necessary to periodically remove accumulated sediment and debris. The removed portion is then allowed to dry out and is then redistributed and reincorporated back into the field(s). On the NALF, there are field basins at fields 1 (serving fields 1 and 2), 9 and 10. In addition, there is a main sediment basin at the outflow from the Base at the Marshall Road Drain.

Furrow Dams: Small check dams installed in individual furrows to reduce sediment leaving the field.

Furrow Length Reduction: Shortening the lengths of the furrows allows for the reduction of water inflow rates and better water distribution, therefore, less erosion and sediment leaving the field. But in the case of siphon irrigation, this technique does require more supply ditches and whether or not less soil is eroded is unclear. With the use of gated pipe or surge irrigation, however, reduced furrow lengths have proven beneficial.

Gated Pipe: This practice allows for adjustable flow rates, initially fast to shorten the water advance time and then reduced to improve the infiltration rate. Gated pipe eliminates the need for supply ditches. An underground water supply is needed and the pipe is advanced to the next portion of the field when the water requirement is met. If managed correctly, gated pipe will produce tailwater only on the last irrigation run of the field.

Grassed Waterway: Natural or constructed wide, shallow, low-velocity tailwater channels planted with vegetation to reduce the amount of sediment after the water has left the field. May be considered a sediment basin/vegetative filter strip hybrid.

APPENDIX A: DESCRIPTION OF BEST MANAGEMENT PRACTICES (BMPs) continued

Horseshoe Drain: A concrete drop inlet structure used at the drainage point of a field to minimize erosion by tailwater.

Irrigation Water Management: Using a combination of water-efficient application techniques to satisfy a crop's water requirements without allowing excessive erosion and runoff.

Land Leveling: Restoration of a desired uniform slope to provide for efficient water distribution.

Minimum Tillage: Using only the essential number of cultivations, properly timed, necessary to produce a healthy crop. Maintains soil structure and permeability.

Reduced Cultivation: Elimination of one or more cultivations per crop growing season. Conserves soil stability and reduces soil compaction.

Sprinkler Irrigation: Allows for efficient and uniform water application without excessive tailwater production and, hence, less erosion.

Sprinkler Pre-irrigation (pre-germination): Uses less water to germinate seeds. More efficient than furrow pre-irrigation.

Surge Irrigation: Used in conjunction with gated pipe, an automated valve alternates water applications between two sets of furrows. Water is thus advanced in a series of pulses enabling quicker and more efficient advance and infiltration rates. Can minimize field runoff volume.

Tailwater Recovery (return) System: Has the potential to eliminate all runoff irrigation water from leaving the field(s) by recycling it back onto the field(s). Consists of a storage pond to collect runoff and a lift pump for redistribution to the field(s).

Tailwater Ditch Tarps: Portable check dams installed in tailwater ditches. Tarps slow water velocity, reduce ditch erosion and allow sediment to settle.

Vegetative Filter Strip: A planting of Sudan grass, Sorgo/Sudan grass or alfalfa on the bottom edge of a field so that irrigation runoff will pass over it before reaching a drain outlet. The strip reduces water velocities, prevents furrow end erosion and filters sediment and other pollutants from the tailwater.

TAB 1

APPENDIX B

APPENDIX B: TRANSFER OF INFORMATION & TECHNOLOGY

Tours, Meetings, Articles

1992

April 22	California Department of Pesticide Regulation Tour
April 23-25	Soil & Water Conservation Society Conference and Tour
June 10	EPA, CalEPA Tour
July 09	RCD Annual Legislators Meeting & Tour
September 01 - 02	National Irrigation Induced Erosion Water Quality Conference - Boise, ID
October 30	Association of California Water Agencies Workshop Presentation - Sacramento, CA
November	Soil & Water Conservation Society Newsletter
November 25	NASA Ames/Boeing Tour

West Stanislaus Hydrologic Unit Area Project 1992 Progress Report

1993

March 21-24	Watershed '93 - A National Conference on Watershed Management - Alexandria, VI
June 16	EPA Tour
June 17	U.C. Student Tour
September 02	RCD Annual Legislators Meeting & Tour

West Stanislaus Hydrologic Unit Area Project 1993 Progress Report

1994

January 24-25	1994 Plant & Soil Conference - San Luis Obispo, CA
May 11	National Meeting of SCS Engineers & Agronomists - Twin Falls, ID
June 15	Cytec Industries, Inc. Tour
July 22	Soil Science Society of America Tour (part of the International Society of Soil Science XV World Congress in Acapulco, Mexico)
September 07	Polymer Meeting to Discuss Use of Polymers in Agricultural Irrigation - Patterson, CA
November 05	Peoples' Republic of China Water Quality Specialists Tour
December 14	Neil Bingert (PRC Environmental Management) Meeting
December 19	GAO Tour

West Stanislaus Hydrologic Unit Area Project 1994 Progress Report

TAB

APPENDIX C

APPENDIX C: SOIL CAPABILITY SUMMARY

Soil Name (Map Symbol)	Land Capability Classification	Composition Percentage	Depth Class	AWC*	Permeability	Drainage Class	Erosion Hazard	Irrigated Crops	Limiting Factors
Capay Clay (100)	IIs5 (irrigated)	90	very deep (60 in$^+$)	high	slow	moderately well drained	slight	row, field, orchard	Slow permeability Clayey texture
Capay Clay, Wet (101)	IIw5 (irrigated)	85	very deep (60 in$^+$)	high	slow	moderately well drained	slight	row, field, orchard	Slow permeability Seasonal high water table
Capay Clay, Loamy substratum (102)	IIs5 (irrigated)	85	very deep (60 in$^+$)	high	slow/ moderate in substratum	moderately well drained	slight	row, field, orchard	Slow permeability Clayey surface
Capay Clay, rarely flooded (106)	IIs5 (irrigated)	90	very deep (60 in$^+$)	high	slow	moderately well drained	slight	row, field, orchard	Slow permeability Clayey surface
Vernalis-Zacharias complex (120)	I (irrigated)	45/40	very deep (60 in$^+$)	high	moderate/ moderately slow	well drained	slight	row, field, orchard	None
Vernalis Loam (122)	I (irrigated)	85	very deep (60 in$^+$)	high	moderate	well drained	slight	row, field, orchard	None
Zacharias Clay Loam (140)	I (irrigated)	90	very deep (60 in$^+$)	high	moderately slow	well drained	slight	row, field, orchard	None

*AWC = Available Water Holding Capacity for the entire soil profile

TAB
APPENDIX D

APPENDIX D: FIELD HISTORIES FIELD 1 SOILS: Capay Clay (101)
Capay Clay (102)
Zacharias (140)
SLOPE: 0.4

YEAR: 1990
CROP: Tomatoes (to 08/13)
ACREAGE: 84

EST. WATER USE:	171 acre-feet (2.04 ac-ft/ac)	
FERTILIZER USE:	None	
HERBICIDE USE:	03/23	Tillam (C), 45 gal. (0.5 gal/ac), (I)
	05/04	Treflan, 10 gal. (1 pt/ac), (I)
		Tillam (C), 82 gal. (1 gal/ac), (I)
INSECTICIDE USE:	None	

YEAR: 1991
CROP: Dry Limas (05/20 to 10/20)
ACREAGE: 97 (3 fallow)

EST. WATER USE:	182 acre-feet (1.88 ac-ft/ac)	
FERTILIZER USE:	06/20	32-0-0, 2910 gal. (30 gal/ac), (SI)
HERBICIDE USE:	05/18	Sonalan, 126 qts. (1.25 qt/ac), (I)
INSECTICIDE USE:	08/01	Kelthane (OC), 97 qts. (1 qt/ac), (GS)
	09/01	Orthene (OP), 112.5 lbs. (AS)

YEAR: 1992
CROP: Tomatoes (04/17 to 09/10)
ACREAGE: 100

EST. WATER USE:	204 acre-feet (2.04 ac-ft/ac)	
FERTILIZER USE:	05/26	unknown
HERBICIDE USE:	None	
INSECTICIDE USE:	05/14	Sevin (C), unknown (AS)
	08/07	Sulfur, 4000 lbs. (40 lb/ac), (AS)
	08/22	Lannate (C), 75 lbs. (0.75 lb/ac), (AS)
		Asana, 25 qts. (0.5 pt/ac), (AS)
	09/01	Lannate (C), 35 lbs. (2/3 lb/ac)(55A), (AS)
		Asana, 3 gal. (0.25 pt/ac)(55A), (AS)

YEAR: 1993
CROP: Silage Corn
ACREAGE: 84

EST. WATER USE:	152 acre-feet (1.81 ac-ft/ac)	
FERTILIZER USE:	None	
HERBICIDE USE:	05/03	2,4-D Amine (OC), 84 pts. (1 pt/ac), (GS)
INSECTICIDE USE:	06/29	Comite, 84 qts. (1 qt/ac), (AS)

YEAR: 1994
CROP: Silage Corn (to 09/01)
ACREAGE: 84

EST. WATER USE:	152 acre-feet (1.81 ac-ft/ac)	
FERTILIZER USE:	04/15	21-0-0, 33,600 lbs. (400 lb/ac), (BC)
	06/01	Tri N/Un 32%, 4200 gal. (50 gal/ac), (SI)
HERBICIDE USE:	05/10	2,4-D Amine (OC), 84 pts. (1 pt/ac), (GS)
	06/06	2,4-D Amine (OC), 84 pts. (1 pt/ac), (GS)
INSECTICIDE USE:	05/30	Comite, 84 qts. (1 qt/ac), (AS)
	06/22	Comite, 84 qts. (1 qt/ac), (AS)

 FIELD 2

SOILS: Capay Clay (102)
Capay Clay (106)
Zacharias (140)
SLOPE: 0.4

YEAR: 1990
CROP: Tomatoes (to 08/13)
ACREAGE: 103

EST. WATER USE:	210 acre-feet (2.04 ac-ft/ac)	
FERTILIZER USE:	None	
HERBICIDE USE:	04/11	Tillam (C), 115 gal. (1 gal/ac), (I)
	05/04	Tillam (C), 115 gal. (1 gal/ac), (I)
		Treflan, 14 gal. (1 pt/ac), (I)
INSECTICIDE USE:	05/15	Asana, 2 gal. (2.5 oz/ac), (AS)
	08/12	Lannate (C), 21 lbs. (0.2 lb/ac), (AS)

YEAR: 1991
CROP: Sugar Beets (01/20 to 09/25)
ACREAGE: 145 (1 fallow)

EST. WATER USE:	499 acre-feet (3.44 ac-ft/ac)	
FERTILIZER USE:	04/28	32-0-0, 15950 gal. (110 gal/ac), (SI)
	07/15	32-0-0, 7250 gal. (50 gal/ac), (WR)
HERBICIDE USE:	None	
INSECTICIDE USE:	06/06	Thimet (OP), 1000 lbs. (7 lb/ac), (AS)
		Bayleton, 45 lbs. (1/3 lb/ac), (AS)
	07/03	Bayleton, 46 lbs. (1/3 lb/ac), (AS)
	07/13	Sulfur, 1450 lbs. (10 lb/ac), (AS)
	08/04	Sulfur, 1450 lbs. (10 lb/ac), (AS)

YEAR: 1992
CROP: Wheat (to 07/27)
ACREAGE: 146

EST. WATER USE:	None	
FERTILIZER USE:	None	
HERBICIDE USE:	03/10	MCPA (OC), 20 gal. (1 pt/ac), (U)
INSECTICIDE USE:	None	

YEAR: 1993
CROP: Wheat
ACREAGE: 162

EST. WATER USE:	None
FERTILIZER USE:	None
HERBICIDE USE:	None
INSECTICIDE USE:	None

YEAR: 1994
CROP: Dry Limas (05/24 to 10/17)
ACREAGE: 162

EST. WATER USE:	305 acre-feet (1.88 ac-ft/ac)	
FERTILIZER USE:	None	
HERBICIDE USE:	04/05	Sonalan, 486 pts. (3 pt/ac), (SI)
INSECTICIDE USE:	06/17	Dicofol (OC), 243 pts. (1.5 pt/ac), (GS)
		Cygon (OP), 162 pts. (1 pt/ac), (GS)
	07/10	Dicofol (OC), 135 qts. (1 qt/ac), (135A) (GS)
		Cygon (OP), 135 pts. (1 pt/ac), (135A) (GS)

APPENDIX D: FIELD HISTORIES continued **FIELD 3**

SOILS: Capay Clay (102)
Capay Clay (106)
Zacharias (140)
SLOPE: 0.4

YEAR: 1990
CROP: Tomatoes 50A (to 08/06)/Sugar Beets 50A
ACREAGE: 100 (12 fallow)

EST. WATER USE:	274 acre-feet (2.04 ac-ft/ac T / 3.44 ac-ft/ac SB)	
FERTILIZER USE:	None	
HERBICIDE USE:	02/25	Desmedipham, 76.5 pts. (4.5 pt/ac), (17A)(Sugar Beets) (U)
		Poast, 17 pts. (1 pt/ac)(17A), (Sugar Beets) (U)
	04/10	Tillam (C), 41 gal. (Tomatoes) (1 gal/ac), (I)
	04/20	Treflan, 25 pts. (Sugar Beets) (0.5 pt/ac), (I)
INSECTICIDE USE:	05/26	Sulfur, 1750 lbs. (35 lb/ac), (Sugar Beets) (AS)
	06/12	Sulfur, 1750 lbs. (35 lb/ac), (Sugar Beets) (AS)
	06/22	Sulfur, 1750 lbs. (35 lb/ac), (Sugar Beets) (AS)
	08/13	Lannate (C), 25 lbs. (0.5 lb/ac), (Sugar Beets) (AS)
		Dibrom (OP), 50 pts. (1 pt/ac), (Tomatoes) (AS)
	09/01	Lannate (C), 25 lbs. (0.5 lb/ac), (Sugar Beets) (AS)
		Dibrom (OP), 50 pts. (1 pt/ac), (Tomatoes) (AS)

YEAR: 1991
CROP: Dry Limas (05/20 to 10/22)
ACREAGE: 53

EST. WATER USE:	100 acre-feet (1.88 ac-ft/ac)	
FERTILIZER USE:	06/20	32-0-0, 1590 gals. (30 gal/ac), (SI)
HERBICIDE USE:	05/16	Sonalan, 159 pts. (3 pt/ac), (I)
INSECTICIDE USE:	08/01	Kelthane (OC), 53 qts. (1 qt/ac), (AS)
	08/21	Orthene (OP), 52 lbs. (1 lb/ac), (AS)
		Comite, 15 gal. (2.25 pt/ac), (AS)
	09/05	Orthene (OP), 80 lbs. (1.5 lb/ac), (AS)

YEAR: 1992
CROP: Tomatoes (04/17 to)8/27)
ACREAGE: 53

EST. WATER USE:	108 acre-feet (2.04 ac-ft/ac)	
FERTILIZER USE:	05/26	unknown
HERBICIDE USE:	None	
INSECTICIDE USE:	08/07	Sulfur, 2120 lbs. (40 lb/ac), (AS)
	08/22	Lannate (C), 40 lbs. (0.75 lb/ac), (AS)
		Asana, 13 qts. (0.5 pt/ac), (AS)

YEAR: 1993
CROP: Silage Corn
ACREAGE: 53

EST. WATER USE:	96 acre-feet (1.81 ac-ft/ac)	
FERTILIZER USE:	11/17	11-52-0, 21,200 lbs. (400 lb/ac), (BC)
HERBICIDE USE:	05/03	2,4-D Amine (OC), 53 pts. (1 pt/ac), (GS)
INSECTICIDE USE:	06/28	Comite, 53 qts. (1 qt/ac), (AS)

YEAR: 1994
CROP: Alfalfa (to 10/13)
ACREAGE: 53

EST. WATER USE:	185 acre-feet (3.49 ac-ft/ac)	
FERTILIZER USE:	None	
HERBICIDE USE:	None	
INSECTICIDE USE:	08/27	Lannate (C), 17.5 lbs. (1/3 lb/ac), (AS)

 FIELD 4

SOILS: Capay Clay (100)
Capay Clay (102)
Capay Clay (106)
SLOPE: 0.4

YEAR: 1990
CROP: Tomatoes (to 08/13)
ACREAGE: 115 (1 fallow)

EST. WATER USE:	235 acre-feet (2.04 ac-ft/ac)	
FERTILIZER USE:	None	
HERBICIDE USE:	03/17	Tillam (C), 52 gal. (1/3 gal/ac), (I)
INSECTICIDE USE:	05/04	Asana, 1 gal. (4.25 oz/ac)(30A), (AS)

YEAR: 1991
CROP: Fallow/Broccoli (planted 09/22)
ACREAGE: 100 (16 fallow)

EST. WATER USE:	116 acre-feet	
FERTILIZER USE:	09/01	5-11-10, 4000 lbs. (40 lb/ac), (SI)
	10/15	32-0-0, 3000 gal. (30 gal/ac), (SI)
HERBICIDE USE:	08/16	Treflan, 100 pts. (1 pt/ac), (I)
INSECTICIDE USE:	10/08	Monitor (OP), 40 qts. (1 qt/ac)(40A), (AS)
	10/24	Monitor (OP), 100 qts. (1 qt/ac), (AS)

YEAR: 1992
CROP: Dry Limas (06/05 to 09/24)
ACREAGE: 116

EST. WATER USE:	218 acre-feet (1.88 ac-ft/ac)	
FERTILIZER USE:	None	
HERBICIDE USE:	None	
INSECTICIDE USE:	07/25	Dicofol (OC), 45 gal. (1.5 qt/ac), (AS)
		Dimethoate (OP), 22 gal. (1.5 pt/ac), (AS)
	08/22	Orthene (OP), 60 lbs. (0.5 lb/ac), (AS)
		Comite, 30 gal. (1 qt/ac), (AS)

YEAR: 1993
CROP: Silage Corn
ACREAGE: 116

EST. WATER USE:	210 acre-feet (1.81 ac-ft/ac)	
FERTILIZER USE:	None	
HERBICIDE USE:	None	
INSECTICIDE USE:	06/28	Comite, 29 gal. (1 qt/ac), (AS)

YEAR: 1994
CROP: Dry Limas (06/03 to 09/28)
ACREAGE: 116

EST. WATER USE:	218 acre-feet (1.88 ac-ft/ac)	
FERTILIZER USE:	None	
HERBICIDE USE:	04/13	Sonalan, 348 pts. (3 pt/ac), (I)
INSECTICIDE USE:	07/11	Dicofol (OC), 104.4 qts. (1 qt/ac), (GS)
		Cygon (OP), 104 pts. (1 pt/ac), (GS)

YEAR: 1990 SLOPE: 0.6
CROP: Sugar Beets (to 09/25)
ACREAGE: 48

EST. WATER USE:	165 acre-feet (3.44 ac-ft/ac)	
FERTILIZER USE:	None	
HERBICIDE USE:	04/18	Treflan, 24 pts. (0.5 pt/ac), (I)
INSECTICIDE USE:	06/02	Sulfur, 1680 lbs. (35 lb/ac), (AS)
	06/16	Sulfur, 1680 lbs. (35 lb/ac), (AS)
	07/26	Sulfur, 700 lbs.(35 lb/ac)(20A), (AS)
	08/13	Lannate (C), 24 lbs. (0.5 lb/ac), (AS)
		Dibrom (OP), 48 pts. (1 pt/ac), (AS)
	09/01	Lannate (C), 24 lbs. (0.5 lb/ac), (AS)
		Dibrom (OP), 48 pts. (1 pt/ac), (AS)

YEAR: 1991
CROP: Fallow
ACREAGE: 48

EST. WATER USE:	None
FERTILIZER USE:	None
HERBICIDE USE:	None
INSECTICIDE USE:	None

YEAR: 1992
CROP: Tomatoes (to 08/20)
ACREAGE: 48

EST. WATER USE:	98 acre-feet (2.04 ac-ft/ac)	
FERTILIZER USE:	05/07	unknown
	06/27	10-12-0, 120 gal. (2.5 gal/ac), (AS)
HERBICIDE USE:	None	
INSECTICIDE USE:	06/27	Monitor (OP), 13.5 gal. (2 pt/ac), (AS)

YEAR: 1993
CROP: Silage Corn
ACREAGE: 48

EST. WATER USE:	87 acre-feet (1.81 ac-ft/ac)	
FERTILIZER USE:	11/07	21-0-0, 19,200 lbs. (400 lb/ac), (BC)
HERBICIDE USE:	None	
INSECTICIDE USE:	06/29	Comite, 48 qts. (1 qt/ac), (AS)

YEAR: 1994
CROP: Oats/Fallow (after 06/13)/Winter Wheat
ACREAGE: 48

EST. WATER USE:	None
FERTILIZER USE:	None
HERBICIDE USE:	None
INSECTICIDE USE:	None

 FIELD 6 SOILS: Capay Clay (102)
Capay Clay (106)
SLOPE: 0.6

YEAR: 1990
CROP: Sugar Beets
ACREAGE: 48

EST. WATER USE:	165 acre-feet (3.44 ac-ft/ac)	
FERTILIZER USE:	None	
HERBICIDE USE:	04/19	Treflan, 24 pts. (0.5 pt/ac), (I)
INSECTICIDE USE:	06/02	Sulfur, 1680 lbs. (35 lb/ac), (AS)
	06/16	Sulfur, 1680 lbs. (35 lb/ac), (AS)
	07/26	Sulfur, 1680 lbs. (35 lb/ac), (AS)
	08/13	Lannate (C), 24 lbs. (0.5 lb/ac), (AS)
		Dibrom (OP), 48 pts. (1 pt/ac), (AS)
	09/01	Lannate (C), 24 lbs. (0.5 lb/ac), (AS)
		Dibrom (OP), 48 pts. (1 pt/ac), (AS)

YEAR: 1991
CROP: Fallow
ACREAGE: 48

EST. WATER USE:	None
FERTILIZER USE:	None
HERBICIDE USE:	None
INSECTICIDE USE:	None

YEAR: 1992
CROP: Tomatoes (to 08/05)
ACREAGE: 48

EST. WATER USE:	98 acre-feet (2.04 ac-ft/ac)	
FERTILIZER USE:	05/04	unknown
	06/15	unknown (WR)
	06/27	10-12-0, 120 gal. (2.5 gal/ac), (AS)
HERBICIDE USE:	None	
INSECTICIDE USE:	06/27	Monitor (OP), 13.5 gal. (2 pt/ac), (AS)

YEAR: 1993
CROP: Oats/Silage Corn
ACREAGE: 48

EST. WATER USE:	87 acre-feet (1.81 ac-ft/ac)	
FERTILIZER USE:	11/17	21-0-0, 19,200 lbs. (400 lb/ac), (BC)
HERBICIDE USE:	None	
INSECTICIDE USE:	06/28	Comite, 48 qts. (1 qt/ac), (AS)

YEAR: 1994
CROP: Oats (to 05/23)/Silage Corn (06/15 to 10/22)/Winter Wheat
ACREAGE: 48

EST. WATER USE:	87 acre-feet (1.81 ac-ft/ac)	
FERTILIZER USE:	05/20	21-0-0, 19,200 lbs. (400 lb/ac), (BC)
	06/17	Tri N/Un 32%, 2,400 gal. (50 gal/ac), (SI)
HERBICIDE USE:	None	
INSECTICIDE USE:	None	

FIELD 7

SOILS: Capay Clay (100)
Capay Clay (102)
Capay Clay (106)
SLOPE: 0.6

YEAR: 1990		
CROP: Sugar Beets		
ACREAGE: 123		
EST. WATER USE:	423 acre-feet (3.44 ac-ft/ac)	
FERTILIZER USE:	None	
HERBICIDE USE:	04/17	Treflan, 61.5 pts. (0.5 pt/ac), (I)
INSECTICIDE USE:	06/02	Sulfur, 4305 lbs. (35 lb/ac), (AS)
	06/16	Sulfur, 4305 lbs. (35 lb/ac), (AS)
	08/13	Lannate (C), 61.5 lbs. (0.5 lb/ac), (AS)
		Dibrom (OP), 123 pts. (1 pt/ac), (AS)
	09/01	Lannate (C), 61.5 lbs. (0.5 lb/ac), (AS)
		Dibrom (OP), 123 pts. (1 pt/ac), (AS)

YEAR: 1991		
CROP: Tomatoes (04/15 to 09/01)		
ACREAGE: 123		
EST. WATER USE:	251 acre-feet (2.04 ac-ft/ac)	
FERTILIZER USE:	04/12	10-34-0, 3075 gal. (25 gal/ac), (SI)
	05/01	32-0-0, 3690 gal. (30 gal/ac), (SI)
	07/07	17-0-0, 1230 gal. (10 gal/ac), (WR)
HERBICIDE USE:	04/12	Treflan, 123 pts. (1 pt/ac), (I)
INSECTICIDE USE:	07/14	Sulfur, 4920 lbs. (40 lb/ac), (AS)
	07/19	Bacillus Th., 154 lbs. (1.5 lb/ac), (AS)
	08/06	Sulfur, 4920 lbs. (40 lb/ac), (AS)

YEAR: 1992		
CROP: Wheat (to 06/25)		
ACREAGE: 123		
EST. WATER USE:	None	
FERTILIZER USE:	None	
HERBICIDE USE:	02/28	MCPA (OC), 15 gal. (1 pt/ac), (U)
INSECTICIDE USE:	None	

YEAR: 1993		
CROP: Wheat		
ACREAGE: 123		
EST. WATER USE:	None	
FERTILIZER USE:	None	
HERBICIDE USE:	None	
INSECTICIDE USE:	None	

YEAR: 1994		
CROP: Green Beans (06/21 to 10/08)		
ACREAGE: 123		
EST. WATER USE:	192 acre-feet (1.56 ac-ft/ac)	
FERTILIZER USE:	None	
HERBICIDE USE:	None	
INSECTICIDE USE:	06/29	Dicofol (OC), 123 qts. (1 qt/ac), (AS)
		Cygon (OP), 123 pts. (1 pt/ac), (AS)
	07/19	Dicofol (OC), 123 qts. (1 qt/ac), (GS)
		Cygon (OP), 100 pts. (0.8 pt/ac), (GS)
	08/24	Cygon (OP), 184.5 pts. (1.5 pt/ac), (AS)
		Orthene (OP), 163.5 lbs. (1 1/3 lb/ac), (AS)
	09/20	Lannate (C), 61.5 lbs (0.5 lb/ac), (AS)

 FIELD 8 SOILS: Capay Clay (100)
Capay Clay (102)
SLOPE: 0.6

YEAR: 1990
CROP: Alfalfa
ACREAGE: 103

EST. WATER USE:	359 acre-feet (3.49 ac-ft/ac)	
FERTILIZER USE:	None	
HERBICIDE USE:	01/09	Diuron (OC), 242.5 lbs. (2.4 lb/ac), (U)
	02/08	Diuron (OC), 285 lbs. (2.8 lb/ac), (U)
INSECTICIDE USE:	03/18	Furadan (OC), 97 pts. (0.9 pt/ac), (AS)

YEAR: 1991
CROP: Tomatoes 40A (04/12 to 08/20)/Alfalfa 63A
ACREAGE: 103

EST. WATER USE:	302 acre-feet (2.04/3.49 ac-ft/ac)	
FERTILIZER USE:	05/08	10-34-0, 2575 gal. (25 gal/ac), (SI)
	05/10	32-0-0, 3090 gal. (30 gal/ac), (SI)
	07/10	17-0-0, 1030 gal. (10 gal/ac), (WR)
HERBICIDE USE:	None	
INSECTICIDE USE:	07/14	Sulfur, 2400 lbs. (60 lb/ac)(40A), (AS)
	07/20	Bacillus Th., 76 lbs. (2 lb/ac)(40A), (AS)
	08/06	Sulfur, 2520 lbs. (63 lb/ac)(40A), (AS)
	08/09	Lannate (C), 60 lbs. (1 lb/ac)(63A), (AS)

YEAR: 1992
CROP: Sugar Beets (to 09/24)
ACREAGE: 40 (63 Fallow-NASA)

EST. WATER USE:	138 acre-feet (3.44 ac-ft/ac)	
FERTILIZER USE:	04/29	unknown (SI)
HERBICIDE USE:	None	
INSECTICIDE USE:	None	

YEAR: 1993
CROP: Silage Corn
ACREAGE: 103

EST. WATER USE:	186 acre-feet (1.81 ac-ft/ac)	
FERTILIZER USE:	None	
HERBICIDE USE:	None	
INSECTICIDE USE:	None	

YEAR: 1994
CROP: Dry Limas (05/26 to 10/19)
ACREAGE: 103

EST. WATER USE:	194 acre-feet (1.88 ac-ft/ac)	
FERTILIZER USE:	None	
HERBICIDE USE:	04/12	Sonalan, 103 qts. (3 pt/ac), (I)
INSECTICIDE USE:	06/29	Dicofol (OC), 112 qts. (1 qt/ac), (GS)
		Cygon (OP), 112 pts. (1 pt/ac), (GS)
	07/10	Dicofol (OC), 103 qts. (1 qt/ac), (GS)
		Cygon (OP), 103 pts. (1 pt/ac), (GS)

SOILS: Capay Clay (102)
Vernalis/Zacharias (120)
Vernalis Loam (122)
SLOPE: 0.7

YEAR: 1990
CROP: Dry Limas
ACREAGE: 113

EST. WATER USE:	212 acre-feet (1.88 ac-ft/ac) (248 actually used)	
FERTILIZER USE:	No Records Available	
HERBICIDE USE:	No Records Available	
INSECTICIDE USE:	No Records Available	

YEAR: 1991
CROP: Tomatoes (04/12 to 08/15)
ACREAGE: 113

EST. WATER USE:	231 acre-feet (2.04 ac-ft/ac) (235 actually used)	
FERTILIZER USE:	04/12	10-34-0, 2825 gal. (25 gal/ac), (SI)
	05/17	32-0-0, 3390 gal. (30 gal/ac), (SI)
HERBICIDE USE:	05/20	Treflan, 75.3 pts. (2/3 pt/ac), (I)
INSECTICIDE USE:	07/14	Sulfur, 4520 lbs. (40 lb/ac), (AS)
	07/19	Bacillus Th., 142 lbs. (1.25 lb/ac), (AS)
	08/06	Sulfur, 4520 lbs. (40 lb/ac), (AS)

YEAR: 1992
CROP: Tomatoes (to 08/19)
ACREAGE: 113

EST. WATER USE:	231 acre-feet (2.04 ac-ft/ac) (243 actually used)	
FERTILIZER USE:	05/07	unknown
	05/14	unknown
	06/27	10-12-0, 565 gal. (5 gal/ac), (AS)
HERBICIDE USE:	None	
INSECTICIDE USE:	06/20	Sulfur, 4520 lbs. (40 lb/ac), (AS)
	06/27	Monitor (OP), 28 gal. (1 qt/ac), (AS)

YEAR: 1993
CROP: Alfalfa
ACREAGE: 113

EST. WATER USE:	394 acre-feet (3.49 ac-ft/ac)	
FERTILIZER USE:	None	
HERBICIDE USE:	None	
INSECTICIDE USE:	None	

YEAR: 1994
CROP: Alfalfa (to 10/20)
ACREAGE: 113

EST. WATER USE:	394 acre-feet (3.49 ac-ft/ac)	
FERTILIZER USE:	None	
HERBICIDE USE:	None	
INSECTICIDE USE:	08/24	Lannate (C), 56.5 lbs. (0.5 lb/ac), (AS)

 FIELD 10

SOILS: Capay Clay (100)
Capay Clay (102)
Vernalis Loam (122)
SLOPE: 0.7

YEAR: 1990
CROP: Alfalfa (to 09/25)
ACREAGE: 163

EST. WATER USE:	569 acre-feet (3.49 ac-ft/ac)	
FERTILIZER USE:	None	
HERBICIDE USE:	01/09	Diuron (OC), 412.5 lbs. (2.5 lb/ac), (U)
INSECTICIDE USE:	03/18	Furadan (OC), 165 pts. (1 pt/ac), (AS)

YEAR: 1991
CROP: Tomatoes (05/20 to 09/22)
ACREAGE: 163

EST. WATER USE:	333 acre-feet (2.04 ac-ft/ac)	
FERTILIZER USE:	04/16	10-34-0, 4075 gal. (25 gal/ac), (SI)
	05/20	10-34-0, 1630 gal. (10 gal/ac), (SI)
	06/20	32-0-0, 4890 gal. (30 gal/ac), (SI)
HERBICIDE USE:	04/20	Devrinol, 326 lbs. (2 lb/ac), (U)
		Tillam (C), 163 gal. (1 gal/ac), (I)
	06/20	Treflan, 109 pts. (2/3 pt/ac), (I)
INSECTICIDE USE:	07/19	Bacillus Th., 204 lbs. (1.25 lb/ac), (AS)
	08/06	Sulfur, 6520 lbs. (40 lb/ac), (AS)
	08/07	Bacillus Th., 172 lbs. (1 lb/ac), (AS)

YEAR: 1992
CROP: Tomatoes (to 08/17)
ACREAGE: 163

EST. WATER USE:	333 acre-feet (2.04 ac-ft/ac)	
FERTILIZER USE:	06/27	10-12-0, 1630 gal. (10 gal/ac), (AS)
HERBICIDE USE:	None	
INSECTICIDE USE:	06/20	Sulfur, 6520 lbs. (40 lb/ac), (AS)
	06/27	Monitor (OP), 40 gal. (1 qt/ac), (AS)

YEAR: 1993
CROP: Dry Limas
ACREAGE: 163

EST. WATER USE:	306 acre-feet (1.88 ac-ft/ac)	
FERTILIZER USE:	None	
HERBICIDE USE:	06/09	Sonalan, 244.5 qts. (3 pt/ac), (I)
INSECTICIDE USE:	07/10	Dicofol (OC), 163 qts. (1 qt/ac), (AS)
		Dimethoate (OP), 163 pts. (1 pt/ac), (AS)
	08/16	Comite, 163 qts. (1 qt/ac), (AS)
	09/04	Lannate (C), 109 lbs. (2/3 lb/ac), (AS)
		Dimethoate (OP), 163 pts. (1 pt/ac), (AS)

YEAR: 1994
CROP: Dry Limas (to 10/01)
ACREAGE: 163

EST. WATER USE:	306 acre-feet (1.88 ac-ft/ac)	
FERTILIZER USE:	None	
HERBICIDE USE:	04/01	Sonalan, 244.5 qts. (1 pt/ac), (I)
INSECTICIDE USE:	06/14	Dicofol (OC), 160 qts. (1 qt/ac), (GS)
		Cygon (OP), 160 pts. (1 pt/ac), (GS)
	07/29	Comite, 163 qts. (1 qt/ac), (AS)
		Orthene (OP), 212 lbs. (1 1/3 lb/ac), (AS)

APPENDIX D: FIELD HISTORIES continued **FIELD 11**

SOILS: Capay Clay (100)
Capay Clay (102)
SLOPE: 0.2

YEAR: 1990
CROP: Alfalfa
ACREAGE: 11 (4 fallow)

EST. WATER USE:	38 acre-feet (3.49 ac-ft/ac)	
FERTILIZER USE:	None	
HERBICIDE USE:	02/08	Diuron (OC), 27.5 lbs. (2.5 lb/ac), (U)
INSECTICIDE USE:	03/18	Furadan (OC), 11 pts. (1 pt/ac), (AS)

YEAR: 1991
CROP: Fallow
ACREAGE: 15

EST. WATER USE:	None	
FERTILIZER USE:	None	
HERBICIDE USE:	None	
INSECTICIDE USE:	None	

YEAR: 1992
CROP: Wheat
ACREAGE: 15

EST. WATER USE:	None	
FERTILIZER USE:	None	
HERBICIDE USE:	03/10	MCPA (OC), 15 pts. (1 pt/ac), (U)
INSECTICIDE USE:	None	

YEAR: 1993
CROP: Oats/Fallow
ACREAGE: 15

EST. WATER USE:	None	
FERTILIZER USE:	11/17	21-0-0, 6,000 lbs. (400 lb/ac), (BC)
HERBICIDE USE:	None	
INSECTICIDE USE:	None	

YEAR: 1994
CROP: Oats/Fallow (after 05/23)/Winter Wheat
ACREAGE: 15

EST. WATER USE:	None	
FERTILIZER USE:	None	
HERBICIDE USE:	None	
INSECTICIDE USE:	None	

SOILS: Capay Clay (100)
Capay Clay (106)
SLOPE: 0.3

YEAR: 1990
CROP: Sugar Beets (to 10/02)
ACREAGE: 29 (3 fallow)

EST. WATER USE:	100 acre-feet (3.44 ac-ft/ac)	
FERTILIZER USE:	None	
HERBICIDE USE:	02/25	Desmedipham (C), 45 pts. (4.5 pt/ac), (10A) (U)
		Poast, 10 pts. (1 pt/ac)(10A), (U)
	04/13	Treflan, 14.5 pts. (0.5 pt/ac), (I)
INSECTICIDE USE:	06/12	Sulfur, 1015 lbs. (35 lb/ac), (AS)
	06/22	Sulfur, 1015 lbs. (35 lb/ac), (AS)
	08/13	Lannate (C), 14.5 lbs. (0.5 lb/ac), (AS)
		Dibrom (OP), 29 pts. (1 pt/ac), (AS)
	09/01	Lannate (C), 14.5 lbs. (0.5 lb/ac), (AS)
		Dibrom (OP), 29 pts. (1 pt/ac), (AS)

YEAR: 1991
CROP: Alfalfa (planted 12/25)
ACREAGE: 32

EST. WATER USE:	112 acre-feet (3.49 ac-ft/ac)	
FERTILIZER USE:	01/10	11-48-0, 8000 lbs. (250 lb/ac), (BC)
HERBICIDE USE:	None	
INSECTICIDE USE:	None	

YEAR: 1992
CROP: Alfalfa (to 09/24)
ACREAGE: 32

EST. WATER USE:	112 acre-feet (3.49 ac-ft/ac)	
FERTILIZER USE:	None	
HERBICIDE USE:	None	
INSECTICIDE USE:	08/18	Lorsban (OP), 4 gal. (1 pt/ac), (AS)

YEAR: 1993
CROP: Alfalfa
ACREAGE: 32

EST. WATER USE:	112 acre-feet (3.49 ac-ft/ac)
FERTILIZER USE:	None
HERBICIDE USE:	None
INSECTICIDE USE:	None

YEAR: 1994
CROP: Alfalfa/Fallow (after 06/22)/Winter Wheat
ACREAGE: 32

EST. WATER USE:	51 acre-feet (3.49 ac-ft/ac)
FERTILIZER USE:	None
HERBICIDE USE:	None
INSECTICIDE USE:	None

YEAR: 1990
CROP: Sugar Beets (to 10/02)
ACREAGE: 15

EST. WATER USE:	52 acre-feet (3.44 ac-ft/ac)	
FERTILIZER USE:	None	
HERBICIDE USE:	None	
INSECTICIDE USE:	None	

YEAR: 1991
CROP: Alfalfa (planted 12/25)
ACREAGE: 15

EST. WATER USE:	52 acre-feet (3.49 ac-ft/ac)	
FERTILIZER USE:	01/10	11-48-0, 3750 lbs. (250 lb/ac), (BC)
HERBICIDE USE:	None	
INSECTICIDE USE:	None	

YEAR: 1992
CROP: Alfalfa (to 09/24)
ACREAGE: 15

EST. WATER USE:	52 acre-feet (3.49 ac-ft/ac)	
FERTILIZER USE:	None	
HERBICIDE USE:	None	
INSECTICIDE USE:	08/18	Lorsban (OP), 2 gal. (1 pt/ac), (AS)

YEAR: 1993
CROP: Alfalfa
ACREAGE: 15

EST. WATER USE:	52 acre-feet (3.49 ac-ft/ac)	
FERTILIZER USE:	None	
HERBICIDE USE:	None	
INSECTICIDE USE:	None	

YEAR: 1994
CROP: Alfalfa/Fallow (after 06/22)/Winter Wheat
ACREAGE: 15

EST. WATER USE:	24 acre-feet (3.49 ac-ft/ac)	
FERTILIZER USE:	None	
HERBICIDE USE:	None	
INSECTICIDE USE:	03/18	Lorsban (OP), 15 pts. (1 pt/ac), (GS)

SOIL: Capay Clay (106)
SLOPE: 0.2

YEAR: 1990
CROP: Sugar Beets
ACREAGE: 15

EST. WATER USE:	52 acre-feet (3.44 ac-ft/ac)	
FERTILIZER USE:	None	
HERBICIDE USE:	None	
INSECTICIDE USE:	None	

YEAR: 1991
CROP: Alfalfa (planted 12/25)
ACREAGE: 15

EST. WATER USE:	52 acre-feet (3.49 ac-ft/ac)	
FERTILIZER USE:	01/10	11-48-0, 3750 lbs. (250 lb/ac), (BC)
HERBICIDE USE:	None	
INSECTICIDE USE:	None	

YEAR: 1992
CROP: Alfalfa (to 09/24)
ACREAGE: 15

EST. WATER USE:	52 acre-feet (3.49 ac-ft/ac)	
FERTILIZER USE:	None	
HERBICIDE USE:	None	
INSECTICIDE USE:	08/18	Lorsban (OP), 2 gal. (1 pt/ac), (AS)

YEAR: 1993
CROP: Alfalfa
ACREAGE: 15

EST. WATER USE:	52 acre-feet (3.49 ac-ft/ac)	
FERTILIZER USE:	None	
HERBICIDE USE:	None	
INSECTICIDE USE:	None	

YEAR: 1994
CROP: Alfalfa/Fallow (after 06/22)/Winter Wheat
ACREAGE: 15

EST. WATER USE:	17 acre-feet (3.49 ac-ft/ac)	
FERTILIZER USE:	None	
HERBICIDE USE:	None	
INSECTICIDE USE:	03/15	Lorsban (OP), 15 pts. (1 pt/ac), (GS)

 FIELD 15 SOIL: Capay Clay (106)
SLOPE: 0.3

YEAR: 1990
CROP: Sugar Beets
ACREAGE: 4

EST. WATER USE:	14 acre-feet (3.44 ac-ft/ac)	
FERTILIZER USE:	None	
HERBICIDE USE:	02/25	Desmedipham (C), 9 pts. (2.5 pt/ac)(2A), (U)
		Poast, 2 pts. (1 pt/ac)(2A), (U)
	04/21	Treflan, 2 pts. (0.5 pt/ac), (I)
INSECTICIDE USE:	05/26	Sulfur, 140 lbs. (35 lb/ac), (AS)
	06/12	Sulfur, 140 lbs. (35 lb/ac), (AS)
	06/22	Sulfur, 140 lbs. (35 lb/ac), (AS)
	08/13	Lannate (C), 2 lbs. (0.5 lb/ac), (AS)
		Dibrom (OP), 4 pts. (1 pt/ac), (AS)
	09/01	Lannate (C), 2 lbs. (0.5 lb/ac), (AS)
		Dibrom (OP), 4 pts. (1 pt/ac), (AS)

YEAR: 1991
CROP: Alfalfa (planted 12/25)
ACREAGE: 4

EST. WATER USE:	14 acre-feet (3.49 ac-ft/ac)	
FERTILIZER USE:	01/10	11-48-0, 1000 lbs. (250 lb/ac), (BC)
HERBICIDE USE:	None	
INSECTICIDE USE:	None	

YEAR: 1992
CROP: Alfalfa (to 09/24)
ACREAGE: 4

EST. WATER USE:	14 acre-feet (3.49 ac-ft/ac)	
FERTILIZER USE:	None	
HERBICIDE USE:	None	
INSECTICIDE USE:	08/18	Lorsban (OP), 2 qts. (1 pt/ac), (AS)

YEAR: 1993
CROP: Alfalfa
ACREAGE: 4

EST. WATER USE:	14 acre-feet (3.49 ac-ft/ac)	
FERTILIZER USE:	None	
HERBICIDE USE:	None	
INSECTICIDE USE:	None	

YEAR: 1994
CROP: Silage Corn (to 09/14)/Winter Wheat
ACREAGE: 4

EST. WATER USE:	7 acre-feet (1.81 ac-ft/ac)	
FERTILIZER USE:	None	
HERBICIDE USE:	None	
INSECTICIDE USE:	07/20	Comite, 4 qts. (1 qt/ac), (AS)

YEAR: 1990
CROP: Sugar Beets (to 10/02)
ACREAGE: 28

EST. WATER USE:	96 acre-feet (3.44 ac-ft/ac)	
FERTILIZER USE:	None	
HERBICIDE USE:	None	
INSECTICIDE USE:	03/18	Furadan (OC), 28 pts. (1 pt/ac), (AS)

YEAR: 1991
CROP: Alfalfa (planted 12/25)
ACREAGE: 28

EST. WATER USE:	98 acre-feet (3.49 ac-ft/ac)	
FERTILIZER USE:	01/10	11-48-0, 7000 lbs. (250 lb/ac), (BC)
HERBICIDE USE:	None	
INSECTICIDE USE:	None	

YEAR: 1992
CROP: Alfalfa (to 09/24)
ACREAGE: 28

EST. WATER USE:	98 acre-feet (3.49 ac-ft/ac)	
FERTILIZER USE:	None	
HERBICIDE USE:	None	
INSECTICIDE USE:	08/18	Lorsban (OP), 3.5 gal. (1 pt/ac), (AS)

YEAR: 1993
CROP: Alfalfa
ACREAGE: 28

EST. WATER USE:	98 acre-feet (3.49 ac-ft/ac)	
FERTILIZER USE:	None	
HERBICIDE USE:	None	
INSECTICIDE USE:	None	

YEAR: 1994
CROP: Silage Corn (to 09/14)/Winter Wheat
ACREAGE: 28

EST. WATER USE:	51 acre-feet (1.81 ac-ft/ac)	
FERTILIZER USE:	None	
HERBICIDE USE:	None	
INSECTICIDE USE:	03/15	Lorsban (OP), 28 pts. (1 pt/ac), (GS)
	06/22	Comite, 28 qts. (1 qt/ac), (AS)
	07/20	Comite, 28 qts. (1 qt/ac), (AS)

*Estimated water use was determined by an equation based on the cumulative consumptive use of the crop under consideration. The actual water applied per field was not measured with the exception of field 9 from 1990 through 1992.

SCS Newman Station results based on the modified Blaney-Criddle Method:

Crop	ac-ft/ac x Acreage = Consumptive water use estimate
Alfalfa	3.49
Broccoli	1.16
Dry Limas	1.88
Green Beans	1.56
Sugar Beets	3.44
Silage Corn (Silage)	1.81
Tomatoes	2.04
Winter Oats	none
Winter Wheat	none

Notations after pesticides refer to chemical family if applicable:

(C) = carbamate

(OC) = organochlorine

(OP) = organophosphate

Notation (number A) = number of acres treated.

Notations after chemical amount refer to method of application:

(AS) = Aerial spray

(BC) = Broadcast

(GS) = Ground spray

(I) = Incorporated into soil

(SI) = Shank injection

(U) = Unknown

(WR) = Water run

TAB

APPENDIX E

APPENDIX E: YEARLY FIELD & SAMPLING SITE ANALYSES

Location #	1992	1993	1994
Field 1-1	TSS	TSS	EC,TSS
1-2	TSS	-	EC,TSS
1-3	TSS,OC,OP	-	EC,TSS
1-4	TSS	TSS	EC,TSS,OC,OP,C
Field 2-1	TSS	-	EC,TSS
2-2	TSS	-	EC,TSS
Field 3-1	TSS	-	EC,TSS
3-2	TSS	TSS	EC,TSS
3-3	-	TSS	EC,TSS
Field 4-A	-	-	EC
4-B	-	-	EC,TSS
4-C	-	-	TSS,OC,OP
4-1	-	-	TSS,OC,OP
4-2	OC,OP	-	EC,TSS
Field 5-1	TSS	TSS	-
5-2	TSS	TSS	-
Field 6-1	TSS	TSS	EC,TSS
6-2	TSS	TSS	EC,TSS
Field 7-1	-	-	EC,TSS
Site 4	-	-	EC,TSS,OC,OP,C
Field 8-1	TSS	-	EC,TSS
8-2	-	-	-
8-3	TSS	-	EC,TSS
8-4	-	TSS	-
Site 5	TSS	TSS	EC,TSS
Field 9-1(A)	TSS	TSS	EC
9-2	TSS	-	EC,TSS,OC,OP,C
9-3(B)	TSS	-	-
Site 7	TSS	TSS	TSS
Field 10-1	-	-	EC,TSS
10-2	-	TSS	EC,TSS
10-3	-	TSS	TSS
10-4	TSS	TSS,OC,OP	EC,TSS
10-5	TSS	TSS,OC,OP	EC,TSS
10-6	-	-	EC,TSS
Field 12-1	TSS	TSS	-
Field 13-1	-	TSS	-
Field 14-1	TSS	TSS	TSS
Field 15-1	TSS	TSS	EC,TSS
Field 16-1	TSS	TSS	EC,TSS
Site 6	TSS,OC,OP,C	EC,TSS,OC,OP,C	EC,TSS,OC,OP,C
Site 2	TSS	EC,TSS	EC,TSS,OC,OP,C
Site 1	EC,TSS,OC,OP,C	EC,TSS,OC,OP,C	EC,TSS,OC,OP,C
DMC Water	EC	EC	EC,TSS,OC,OP,C

EC = Electrical Conductivity
TSS = Total Suspended Solids
- = no samples taken

OC = Organochlorine analysis
OP = Organophosphate analysis
C = Carbamate analysis

TAB

APPENDIX F

APPENDIX F: AVERAGE TSS PRODUCTION BY CROP
(in mg/L)

Crop	1992	1993	1994	3 Year Average
Alfalfa				
planted acreage	94	207	228	529
% of total acreage	8.9%	18.4%	20.3%	15.9%
average TSS	194	293	588	358
Beans, Green				
planted acreage	NP	NP	123	123
% of total acreage	-	-	11.0%	3.7%
average TSS	-	-	2119	2119
Beans, Dry				
planted acreage	116	163	544	823
% of total acreage	11.0%	14.5%	48.5%	24.7%
average TSS	2105	5343	2074	3174
Corn, Silage				
planted acreage	NP	452	164	616
% of total acreage	-	40.3%	14.6%	18.3%
average TSS	-	1399	1197	1298
Oats				
planted acreage	NP	15	63	78
% of total acreage	-	1.3%	5.6%	2.3%
average TSS	-	ND	ND	ND
Sugar Beets				
planted acreage	40	NP	NP	40
% of total acreage	3.8%	-	-	1.3%
average TSS	425	-	-	425
Tomatoes				
planted acreage	509	NP	NP	509
% of total acreage	48.1%	-	-	16.0%
average TSS	3434	-	-	3434
Wheat				
planted acreage	300	285	NP	585
% of total acreage	28.3%	25.4%	-	17.9%
average TSS	172	ND	-	172

ND = TSS was not determined
NP = crop was not planted

TAB

Appendix G

APPENDIX G: ELECTRICAL CONDUCTIVITY DATA
(in microsiemens/cm)

Date	Location	Reading
	1992	
04/20	S1	(1304)
04/30	S1	(1215)
05/04	S1	(853)
05/07	S1	512
	S1	(565)
05/12	S1	(1390)
05/14	S1	832
	S1	(1258)
05/18	S1	(636)
05/20	DMC	320
05/28	S1	768
	S1	(852)
06/02	S1	640
06/09	S1	512
	S1	(816)
06/15	S1	832
	S1	(1266)
06/17	F10WW	960
06/18	S2	960
06/19	S1	896
	S1	(1134)
06/25	F10WW	896
06/26	F3WW	1024
	DMC	576
07/02	S1	(1166)
07/20	S1	768
09/01	S1	832

Date	Location	Reading
	1993	
05/13	S1	384
05/17	S1	448
05/20	S1	576
05/25	S1	640
06/10	S1	448
06/17	S2	960
06/19	S1	448
	S2	448
06/22	S1	576
06/24	S6	448
06/28	S1	384
07/12	S2	192
07/13	S1	512
07/15	S1	384
	S6	192
07/19	DMC	256
07/21	S1	256
	S6	192
07/22	S2	192
07/27	S1	256
07/29	S6	192
08/10	S1	256
	S6	320
08/16	S1	256
	S6	128
08/20	S1	256
	S2	192
	S6	192
08/31	S1	256
	S2	192
	S6	256
09/08	S1	256
09/13	S6	192
09/16	S1	192
09/17	S6	192
09/20	S1	192
	S2	192
	S6	256

Date	Location	Reading
	1994	
07/27	S1	704
07/28	S1	768
	F1-4	832
	F15-1	864
	F16-1	896
	S4	1056
	F10-6	576
	F8SW	928
07/29	S1	832
	F2MHD	1056
	F2-1	864
	F2-2	1056
	F8-1	960
08/02	F6S	1024
	F6-2	512
	F15-1	896
08/03	S1	896
	F4-2	1056
08/04	S1	928
	S2	864
	F4S	1056
	F4-2	1056
	F6-2	1024
	F7-1	896
	F10-1	352
	F10-2	352
08/05	S1	896
	F3-3	896
	F10-4	384
	F10-5	448
	F10-6	704
08/08	S1	800
	F1-1	832
	F1-2	832
	F1-4	960
	F8SW	896
08/10	F7S	992
	S4	1024
08/11	F3-1	352
	F3-2	384
08/12	F1S	864
	F1TW	896
	S4	1056
08/15	S1	768
	F1-4	896
	F1VFS	832
	F16SW	800

APPENDIX G: ELECTRICAL CONDUCTIVITY DATA continued

Date	Location 1992	Reading	Date	Location 1993	Reading	Date	Location 1994	Reading
						08/15	F16-1	768
						08/17	S1	672
							S2	576
							S4	1056
							S5	672
						08/18	S1	640
							S4	800
							S6	384
							F15-1	512
						08/19	S1	576
							F3-3	736
							F6-1	992
						08/22	S1	576
							F10-6	928
						08/23	F2SW	640
							F2-2	672
						08/25	S1	736
							F1-4	672
							S2	1024
							F8-3	906
						08/26	S1	896
							F2-1	928
							F2-2	928
						08/29	S1	960
							S4	1120
						08/30	S1	1024
							F15-1	1088
						08/31	S1	1088
							S4	960
						09/01	S1	800
						09/02	S1	800
						09/06	S1	768
							F6S	1088
							F6-1	1088
						09/08	S1	928
						09/09	F6SW	1088
							F6-2	1120
							F7SWG	352
							F7TWG	352
							F7SWS	320
							F7TWS	384
							F9SW	320
						09/12	S1	704
							S2	736
						09/13	S1	800
						09/14	S1	800
							F3-1	1024
							F3-2	992
							F9SW	512

APPENDIX G: **ELECTRICAL CONDUCTIVITY DATA** continued

Date	Location 1992	Reading	Date	Location 1993	Reading	Date	Location 1994/1995	Reading
						09/14	F9-2	416
						09/15	S1	800
						09/16	S1	832
						09/19	S1	832
						09/20	S1	896
						09/23	S1	1024
						09/26	S1	1024
							S2	544
							S6	544
						09/27	S1	832
							S6	544
						09/28	S1	672
						09/29	S1	640
							S6	480
						09/30	S1	576
							S6	512
						10/03	S1	512
							S2	576
							S6	544
						01/10	S1	(192)
							S2	(192)
							S6	(192)

Readings were taken using the Myron Company Agri-Meter with the exception of those in 1992 contained in parentheses which were taken using the Handar 570A Data Acquisition System.

TAB

Appendix H

APPENDIX H: QUALITY ASSURANCE PROJECT PLAN

SWRCB Grant Agreement No. 1-120-255-0

In accordance with 40 CFR 30.503(f) and 40 CFR 31.45

As identified in more detail in the Grant Agreement, the initial pesticides targeted during the demonstration project at the Crows Landing Naval Auxiliary Landing Field in Western Stanislaus County were those detected during past U. S. Geological Survey and Regional Board studies. These included DDT compounds and Toxaphene (organochlorines), Diazinon and Parathion (organophosphates), and Carbaryl, Carbofuran and Diuron (carbamates). Additional pesticides were targeted over the course of the project based upon application, rates and methods. The pesticides, timing, rates and methods of chemical use were provided in advance to the monitoring staff by the Base personnel and the farmer. Quarterly reports of laboratory data were to be provided to the Regional Board.

Before the start of pesticide sampling, it was first necessary to find a laboratory which had the capabilities and skills necessary to perform the required analyses. After contacting the California Regional Water Quality Control Board and the Department of Health Services concerning accredited analytical laboratories, the NRCS District Conservationist and the 319 Project Technician visited several in Stanislaus County. On June 11, 1992, they toured one such facility and returned satisfied with the laboratory's organization and abilities. As a result, the West Stanislaus Resource Conservation District Board of Directors and the 319 Project Contract Manager approved a sub-contract with GeoAnalytical Laboratories, Inc of Modesto, CA.

FIELD SAMPLING PROCEDURES:

Sampling procedures were conducted in accordance with EPA and Regional Board guidelines. Appropriately sized solvent rinsed glass amber bottles were obtained from the analyzing laboratory. The bottles were then taken to the selected sampling locations, submerged 0.5 feet beneath the surface, uncapped, filled and recapped while still immersed. Attempts were made to minimize the amount of air bubbles allowed into the containers. The completed samples were then stored on ice and transferred to the laboratory within 24 hours.

Water samples were tested for organochlorines and PCBs (EPA Method 608), organophosphates (EPA Method 622) and carbamates (EPA Method 632) depending upon the specific chemicals under consideration for each analysis. Pesticides were extracted from water-borne sediment using organic solvents and were identified and quantified by gas chromatography using electron capture and thermal ionic specific detectors. Analytical reference standards were used to match peaks on the chromatographs. 10% of the total number of samples supplied to the laboratory were duplicate (blind) samples. This was done to assess the validity of the results obtained from the laboratory. In addition, reagent spike recovery rates were provided by the laboratory to verify the accuracy of their data. Results with an 80 - 120 percent recovery rate were considered acceptable.

Total suspended solids (TSS) samples were made in conjunction with irrigation schedules at predetermined field and drainage sites. The collections were taken with one pint plastic bottles which were rinsed with irrigation water three times before the final filling. Efforts were made to submerge the bottles a minimum of 0.5 feet beneath the surface or, as was often the case with shallow field runoffs, as deeply as possible. The bottles were filled and capped while in the water. If the TSS determinations were not to be performed the day of collection, the samples were refrigerated. Samples were periodically retested to corroborate the results with a 10% conformity considered satisfactory.

Electrical conductivity (EC) data was collected to measure the concentration of dissolved electrolytes (salts) in irrigation water. Samples were collected in one pint plastic bottles at the pre-determined sampling sites. As with the TSS sampling procedures, the bottles were rinsed three times before final collection. Random rechecks of samples were made to assess data accuracy. Additional readings were taken from the Delta Mendota Canal, Patterson tap water and with distilled water (for calibration purposes).

TAB

Appendix 1

APPENDIX I: IRRIGATIONS & CULTIVATIONS

Field	1992 Irrigations	1992 Cultivations	1993 Irrigations	1993 Cultivations	1994 Irrigations	1994 Cultivations
1	04/22-05/04 05/12-05/19 06/11-06/19 07/02-07/07 07/28-08/05	05/26 06/22-06/25	05/27-06/02 06/25-06/28 07/15 07/27-07/30	NA	05/09-05/12 06/13-06/21 06/24-07/01 07/07-07/14 07/21-07/27 08/08-08/15	06/06-06/09
2	04/28-05/12	NA	NA	NA	06/27-07/01 07/12-07/20 07/26-08/02 08/08-08/26	06/13-06/24 07/06-07/08
3	04/27-05/04 05/12-05/14 06/05-06/09 06/15-06/18 07/21 07/30	04/17 05/26	05/26 06/22 07/07 07/22-07/26	NA	06/14-06/17 07/12-07/15 08/11-08/15 09/14-09/20	none
4	05/19-05/21 06/22 07/20-07/29 08/04-08/11 08/24-09/03	05/12	05/21-05/26 06/15-06/22 07/21-07/29	NA	05/09-05/12 06/16-06/17 07/13-07/20 08/02-08/05 08/15-08/19	06/27-06/29 07/07-07/11 07/25-07/29
5	05/18-05/19 06/01-06/05 06/25-06/26 07/13	05/07 05/12	06/08 06/30 07/16 08/05	NA	none	none
6	04/15-04/20 05/15-05/26 06/15-06/18	06/09	06/01-06/03 06/25-06/30 07/15-07/20 08/05	NA	06/21-07/01 08/02-08/08 08/16-08/26 09/06-09/09	07/19
7	05/05-05/07	NA	NA	NA	05/24-06/01 07/25-08/05 08/10-08/19 08/27-09/02 09/09-09/13	07/15-07/21 08/08-08/16
8	05/07-05/18 06/02-06/09 06/17 07/13-07/20 08/18-08/27	04/13	06/30 07/21 08/11 08/19-08/24	NA	05/10 07/05-07/13 07/21-07/29 08/08-08/18 08/23-08/25	06/17-06/22 07/14

APPENDIX I: IRRIGATIONS & CULTIVATIONS continued

Field	1992 Irrigations	1992 Cultivations	1993 Irrigations	1993 Cultivations	1994 Irrigations	1994 Cultivations
9	04/13-04/17 05/19-05/26 06/02-06/09 06/17-06/26 07/02-07/10	04/27-04/30 05/14	09/09	NA	06/13-06/15 07/11 07/30-08/02 08/15-08/17 09/09-09/16	none
10	04/28-05/07 05/21-06/02 06/17-06/25 06/30-07/07	04/17 04/27 05/15-05/19 06/11	05/13-05/20 07/14 07/28-07/29 08/11 08/20-08/26 09/08	NA	06/20-06/30 07/07-07/14 07/22-07/28 08/04-08/22	06/08 07/01 07/11-07/12 07/18-07/22
11	04/13-04/20	NA	NA	NA	none	none
12	04/17 07/13 08/12	NA	07/07 08/02 09/03	08/01 09/02	06/03	none
13	04/17	NA	09/13	NA	06/03	none
14	04/17-04/27 08/12	NA	08/05 09/09	NA	06/03	none
15	04/17-04/27 08/11	NA	06/10 08/05	NA	05/23-05/24 06/23-06/24 07/14-07/15 07/27-07/28 08/02-08/03 08/18-08/19	06/17
16	04/17-04/27 08/18-08/21	NA	06/14 09/13	NA	05/22-05/24 06/22-06/24 07/11-07/13 07/28 08/15-08/17	06/16-06/17

NA = not available

TAB

APPENDIX J

APPENDIX J: TOTAL SUSPENDED SOLIDS (TSS)
(in ppm)

Site 1: NALF exit point at main sump

1992		ppm
04/07	-	71
04/20	-	7
04/30	-	14
05/04	-	50
05/12	-	70
05/18	-	27
06/02	-	25
06/15	-	169
07/02	-	133
07/10	-	2120
07/17	-	55
07/27	-	192
07/31	-	62
08/13	-	58
08/19	-	69
09/01	-	73

1993		ppm
01/13	storm	(710)
05/13	-	121
05/17	-	66
05/20	-	46
05/25	-	120
06/01	-	103
06/10	-	49
06/18	-	22
06/22	-	156
06/28	-	174
07/13	-	180
07/15	-	200
07/21	-	274
07/27	-	336
08/02	-	140
08/10	-	294
08/16	-	119
08/20	-	230
08/31	-	98
09/08	-	80
09/20	-	73

1994/1995		ppm
05/03	-	69
05/09	-	119
05/10	-	102
05/18	-	44
	-	39
05/23	-	58
05/24	-	44
05/26	-	93
	-	104
05/31	-	130
06/03	-	45
06/08	-	361
	-	368
06/21	-	114
06/22	-	46
06/23	-	72
06/30	-	113
07/01	-	82
07/08	-	55
07/11	-	80
07/14	-	61
07/15	-	114
07/18	-	138
07/25	-	109
07/26	-	165
07/27	-	213
07/28	-	106
07/29	-	84
08/03	-	43
08/04	-	74
08/05	-	54
08/08	-	80
08/15	-	138
08/17	-	71
08/19	-	174
08/22	-	169
08/25	-	55
08/29	-	69
08/31	-	30
09/08	-	58
09/12	-	59
09/14	-	34
09/26	-	49
01/10	storm	(1170)

APPENDIX J: TOTAL SUSPENDED SOLIDS (TSS*) continued

Site 2: Entrance to main sump

1992		ppm	1993		ppm	1994/1995		ppm
04/17	-	214	06/01	-	560	05/24	-	456
04/30	-	226	06/17	-	268	05/26	-	494
05/04	-	326	07/12	-	449	05/31	-	390
05/18	-	664	07/22	-	560	06/03	-	486
06/25	-	546	08/20	-	394	06/22	-	500
07/21	-	1610	08/31	-	29	06/23	-	412
07/31	-	1810	09/20	-	42	06/30	-	401
08/13	-	216				07/08	-	883
08/19	-	193				07/14	-	663
09/01	-	354				07/26	-	964
						08/04	-	758
						08/17	-	538
						08/25	-	172
						08/30	-	840
						09/12	-	439
						09/26	-	131
						01/10	storm	(526)

Site 4: Field 7 drain

1992		ppm	1993		ppm	1994		ppm
	none			none		05/24	-	184 (si,fu)
						05/31	-	793 (ga,fu)
						06/23	-	111 (si,fu)
						07/27	-	2240 (si,ga,fu)
						08/10	-	6030 (ga,fu)
						08/12	-	5115 (si,fu)
						08/17	-	3200 (si,fu)
						08/18	-	4005 (si,fu)
						08/29	-	563 (ga,fu)
						08/31	-	840 (si,fu)

Site 5: Field 8 drain

1992		ppm		1993		ppm		1994		ppm	
05/12	-	608	(si,fu)	05/18	-	2675	(si,fu)	05/10	-	1937	(si,fu)
05/15	-	1335	(si,fu)	05/27	-	394	(si,fu)	05/31	-	115	(si,fu)
05/18	-	234	(si,fu)	06/22	-	2590	(si,fu)	06/13	-	80	(si,fu)
06/17	-	1645	(si,fu)	07/12	-	157	(si,fu)	06/14	-	51	(si,fu)
06/19	-	820	(si,fu)	08/16	-	202	(si,fu)	07/08	-	841	(si,fu)
07/17	-	240	(si,fu)	08/19	-	588	(si,fu)	07/13	-	399	(si,fu)
07/20	-	80	(si,fu)					07/19	-	2575	(si,fu)
07/21	-	85	(si,fu)					08/17	-	2505	(si,fu)
07/27	-	114	(si,fu)								

APPENDIX J: TOTAL SUSPENDED SOLIDS (TSS*) continued

Site 5: Field 8 drain continued

1992		ppm		1993		ppm		1994		ppm	
07/30	-	119	(si,fu)								
08/18	-	170	(si,fu)								
08/24	-	419	(si,fu)								
09/01	-	50	(si,fu)								
09/04	-	32	(si,fu)								

Site 6: Little Salado Creek at entrance to NALF

1992		ppm	1993		ppm	1994/1995		ppm
04/30	-	130	01/13	storm	(3940)	05/18	-	6
05/04	-	34	05/13	-	232		-	8
05/12	-	124	06/24	-	24	05/24	-	182
05/18	-	40	07/15	-	69	05/26	-	158
06/09	-	36	07/21	-	39	05/31	-	65
07/07	-	142	07/29	-	63	06/22	-	13
07/13	-	35	08/10	-	360	06/23	-	158
08/17	-	22	08/16	-	23	06/27	-	16
08/26	-	23	08/20	-	81	06/30	-	90
			08/31	-	11	07/21	-	25
			09/13	-	151	08/18	-	18
			09/20	-	48	09/26	-	6
						01/10	storm	(158)

Site 7: Field 9 drain

1992		ppm		1993		ppm		1994		ppm	
04/14	-	262	(si,fu)	06/22	-	21	(NA,fl)	05/31	-	30	(ga,fl)
05/20	-	1175	(si,fu)	06/25	-	28	(NA,fl)	06/13	-	6	(ga,fl)
	-	1195	(si,fu)	07/12	-	30	(NA,fl)	06/27	-	35	(ga,fl)
	-	1865	(si,fu)	07/16	-	48	(NA,fl)				
	-	1830	(si,fu)	08/10	-	394	(NA,fl)				
	-	1815	(si,fu)	08/16	-	29	(NA,fl)				
	-	1410	(si,fu)	09/08	-	246	(NA,fl)				
05/26	-	236	(si,fu)								
06/19	-	1815	(si,fu)								
06/26	-	300	(si,fu)								

APPENDIX J: TOTAL SUSPENDED SOLIDS (TSS*) continued

Field 1:

1992	site	ppm	irr
04/23	F1	442	(si,fu)
04/28	F1-4	2370	(si,fu)
	F1-2	1820	(si,fu)
	F1-3	20	(si,fu)
05/04	F1-4	816	(si,fu)
	F1-RS	40	(si,fu)
	F1-4	573	(si,fu)
05/12	F1-4	216	(si,fu)
06/15	F1RS	51	(si,fu)
	F1-3	4360	(si,fu)
06/25	F1-3	3730	(si,fu)
06/26	F1-3	1440	(si,fu)
	F1-4	1540	(si,fu)
07/07	F1-3	19755	(si,fu)
07/29	F1-4	1213	(si,fu)

1993	site	ppm	irr
05/27	F1	1124	(si,fu)
06/02	F1-4	166	(si,fu)
	F1	2200	(si,fu)
06/25	F1-4	520	(si,fu)
06/28	F1	170	(si,fu)
07/15	F1-4	147	(si,fu)
07/27	F1-4	91	(si,fu)
07/30	F1HDR	217	(si,fu)

1994	site	ppm	irr
05/09	F1-4	134	(si,fu)
06/13	F1-3	4304	(si,fu)
	F1-RS	180	(si,fu)
06/14	F1-RS	431	(si,fu)
06/16	F1-RS	327	(si,fu)
	F1-1	12	(si,fu)
	F1-2	2225	(si,fu)
	F1-3	1290	(si,fu)
06/17	F1MHD	316	(si,fu)
	F1-4	6776	(si,fu)
06/20	F1MHD	395	(si,fu)
	F1-4	4515	(si,fu)
06/21	F1-4	3680	(si,fu)
	F1MHD	1	(si,fu)
06/27	F1-1	209	(si,fu)
06/28	F1-4	1115	(si,fu)
	F1THD	159	(si,fu)
	F1RS	70	(si,fu)
06/30	F1MHD	107	(si,fu)
	F1RS	108	(si,fu)
07/01	F1-4	870	(si,fu)
07/07	F1-1	898	(si,fu)
	F1-2	2440	(si,fu)
07/08	F1-1	14	(si,fu)
	F1-2	61	(si,fu)
	F1-4	1010	(si,fu)
07/11	F1-3	1325	(si,fu)
07/12	F1-4	1210	(si,fu)
07/13	F1MHD	101	(si,fu)
	F1-4	88	(si,fu)
07/14	F1-4	46	(si,fu)
07/20	F1-4	1018	(si,fu)
07/21	F1-1	151	(si,fu)
	F1-4	1795	(si,fu)
07/22	F1MHD	224	(si,fu)
	F1-4	1015	(si,fu)
07/25	F1-4	348	(si,fu)
	F1VFS	59	(si,fu)
07/27	F1-4	2800	(si,fu)
08/08	F1-1	71	(si,fu)
	F1-2	117	(si,fu)
	F1-4	855	(si,fu)
08/12	F1SW	322	(si,fu)
	F1TW	111	(si,fu)
08/15	F1VFS	425	(si,fu)
	F1-4	440	(si,fu)
08/25	F1-4	3065	(si,fu)

APPENDIX J: TOTAL SUSPENDED SOLIDS (TSS*) continued

Field 2:

1992	site	ppm	irr
05/04	F2MHD	80	(ga,fu)
	F2-1	4	(ga,fu)
05/12	F2-2	338	(ga,fu)

1993	site	ppm	irr
	none		

1994	site	ppm	irr
06/27	F2-2	1452	(si,fu)
06/28	F2BHD	118	(si,fu)
07/01	F2-1	11	(si,fu)
07/12	F2BHD	633	(si,fu)
07/18	F2-1	203	(si,fu)
07/26	F2-2	860	(si,fu)
07/29	F2-1	87	(si,fu)
	F2MHD	65	(si,fu)
	F2-2	566	(si,fu)
08/23	F2-1	653	(si,fu)
	F2-2	1510	(si,fu)
08/26	F2-1	890	(si,fu)
	F2-2	3395	(si,fu)

Field 3:

1992	site	ppm	irr
04/29	F3-2	306	(si,fu)
	F3-1	224	(si,fu)
06/18	F3-1	62	(si,fu)
	F3-2	5550	(si,fu)
07/21	F3-2	6235	(si,fu)
07/30	F3-2	7320	(si,fu)

1993	site	ppm	irr
05/26	F3-2	2925	(si,fu)
06/22	F3-2	1805	(si,fu)
07/07	F3-2	2280	(si,fu)
07/22	F3-2RS	1505	(si,fu)
07/26	F3-2	565	(si,fu)

1994	site	ppm	irr
05/26	F3-2	506	(ga,fl)
05/31	F3-2	375	(ga,fl)
06/14	F3-3	30	(ga,fl)
06/16	F3-2	812	(ga,fl)
06/23	F3-2	445	(ga,fl)
07/12	F3-2	19	(ga,fl)
07/13	F3-2	281	(ga,fl)
07/14	F3-1	84	(ga,fl)
	F3-2	436	(ga,fl)
08/05	F3-3	1505	(ga,fl)
08/11	F3-1	26	(ga,fl)
	F3-2	166	(ga,fl)
08/19	F3-3	1433	(ga,fl)
09/14	F3-1	1	(ga,fl)
	F3-2	620	(ga,fl)

Field 4:

1992	site	ppm	irr
07/20	F4-1	5120	(si,fu)
07/21	F4-2	2175	(si,fu)
07/22	F4-2	636	(si,fu)
07/29	F4-2	2420	(si,fu)
08/04	F4-2	11790	(si,fu)
	F4-1	157	(si,fu)
08/10	F4-1	326	(si,fu)
08/11	F4-2	1970	(si,fu)

1993	site	ppm	irr
05/21	F4-2	2275	(si,fu)
05/26	F4-2	202	(si,fu)
06/15	F4-2	743	(si,fu)
06/17	F4-2	188	(si,fu)
06/22	F4-1	3275	(si,fu)
07/21	F4-2	1200	(si,fu)
07/28	F4-1	838	(si,fu)
07/29	F4-2	250	(si,fu)

1994	site	ppm	irr
05/09	F4-B	36	(si,fu)
	F4-C	17	(si,fu)
05/10*	F4SW	36	(si,fu)
	F4C1-1	277	(si,fu)
	F4T1-1	15	(si,fu)
05/12*	F4C2-2	967	(si,fu)
	F4T2-2	45	(si,fu)
	F4C4-2	417	(si,fu)

APPENDIX J: TOTAL SUSPENDED SOLIDS (TSS*) continued

Field 4: continued

1992	site	ppm	irr	1993	site	ppm	irr	1994	site	ppm	irr
08/21	F4-2	1770	(si,fu)					05/12*	F4T4-2	24	(si,fu)
08/24	F4-2	343	(si,fu)					06/16	F4-1	80	(si,fu)
08/25	F4-1	330	(si,fu)					07/13	F4-SW	98	(si,fu)
08/26	F4-1	267	(si,fu)						F4TTW	6495	(si,fu)
08/28	F4-2	552	(si,fu)						F4-2	4110	(si,fu)
	F4-1	48	(si,fu)					07/15*	F4MHD	71	(si,fu)
09/03	F4-2	1720	(si,fu)						F4-1	4195	(si,fu)
									F4-C	86	(si,fu)
									F4PC	3050	(si,fu)
									F4PT	418	(si,fu)
								07/19	F4BCSW	34	(si,fu)
									F4-2	2110	(si,fu)
								08/03	F4-2	363	(si,fu)
								08/04	F4-B	6	(si,fu)

Field 5:

1992	site	ppm	irr	1993	site	ppm	irr	1994	site	ppm	irr
05/19	F5-1	1845	(si,fu)	06/08	F5-1	7790	(si,fu)		none		
06/01	F5-1	2540	(si,fu)	06/30	F5-1	2425	(si,fu)				
06/26	F5-2	1250	(si,fu)	07/16	F5-1	286	(si,fu)				
	F5-1	5480	(si,fu)	08/05	F5-2	290	(si,fu)				
07/13	F5-1	4715	(si,fu)								

Field 6:

1992	site	ppm	irr	1993	site	ppm	irr	1994	site	ppm	irr
05/15	F6-T	1395	(sp,-)	06/01	F6-1	1675	(si,fu)	06/27	F6-1	205	(si,fu)
	F6-2	4270	(si,fu)	06/02*	F6-2	2600	(si,fu)	06/29	F6HD	3	(si,fu)
05/26	F6-2	4750	(si,fu)		F6-SW	93	(si,fu)		F6-1	365	(si,fu)
05/28	F6-1	2440	(si,fu)		F6-PC	2370	(si,fu)	07/27	F6-2	5315	(si,fu)
06/30	F6-2	4210	(si,fu)		F6-PT	186	(si,fu)	08/02	F6-SW	10	(si,fu)
07/02	F6-1	2840	(si,fu)	06/03*	F6-SW	72	(si,fu)		F6-2	195	(si,fu)
					F6-PC	434	(si,fu)	08/04	F6-2	188	(si,fu)
					F6-PT	126	(si,fu)	08/19	F6-1	2073	(si,fu)
				06/25	F6-1	785	(si,fu)	09/06	F6-SW	4	(si,fu)
				06/28	F6-2	910	(si,fu)		F6-1	2080	(si,fu)
				06/30	F6-2	1305	(si,fu)	09/09	F6-SW	343	(si,fu)
				07/15	F6-1	2235	(si,fu)		F6-1	50	(si,fu)
				07/16	F6-2	960	(si,fu)				
				07/20	F6-2	355	(si,fu)				
				08/05	F6-1	2040	(si,fu)				

APPENDIX J: TOTAL SUSPENDED SOLIDS (TSS*) continued

Field 7:

1992	site	ppm	irr	1993	site	ppm	irr	1994	site	ppm	irr
	none				none			08/04	F7-1	230	(ga,fu)
								08/10	F7SW	3	(ga,fu)
								09/09	F7SWG	33	(ga,fu)
									F7TWG	3725	(ga,fu)
									F7SWS	220	(si,fu)
									F7TWS	2695	(si,fu)

Field 8:

1992	site	ppm	irr	1993	site	ppm	irr	1994	site	ppm	irr
05/12	F8-1	993	(si,fu)	06/30	F8MID	1375	(si,fu)	05/03	F8-1	3377	(si,fu)
06/09	F8-3	123	(si,fu)	07/21	F8E	2035	(si,fu)	07/13	F8-1	6710	(si,fu)
06/17	F8-1	2635	(si,fu)	08/11	F8E	140	(si,fu)	07/19	F8-3	540	(si,fu)
07/13	F8-T	26	(si,fu)	08/24	F8E	796	(si,fu)	07/29	F8-1	2670	(si,fu)
07/16	F8-C	19	(si,fu)					08/25	F8-3	7500	(si,fu)
	F8-T	20	(si,fu)								
08/19	F8-1	150	(si,fu)								

Field 9:

1992	site	ppm	irr	1993	site	ppm	irr	1994	site	ppm	irr
04/13	F9-2	808	(si,fu)	09/09	F9SI	42	(NA,fl)	07/11	F9SW	145	(ga,fl)
05/20	F9-A	2325	(si,fu)						F9-2	13	(ga,fl)
	F9-B	4330	(si,fu)					09/14	F9SW	50	(ga,fl)
	F9-A	2025	(si,fu)						F9-2	7	(ga,fl)
	F9-B	2025	(si,fu)								
	F9-A	7190	(si,fu)								
	F9-B	12790	(si,fu)								
	F9-A	15990	(si,fu)								
	F9-B	8390	(si,fu)								
	F9-A	7870	(si,fu)								
	F9-B	4730	(si,fu)								
	F9-A	8710	(si,fu)								
	F9-B	5390	(si,fu)								
	F9-A	7430	(si,fu)								
	F9-B	3730	(si,fu)								
	F9-A	6400	(si,fu)								
	F9-B	2670	(si,fu)								

APPENDIX J: TOTAL SUSPENDED SOLIDS (TSS*) continued

Field 10:

1992	site	ppm	irr
04/29	F10MID	2380	(si,fu)
05/07	F10-4	3150	(si,fu)
	F10-5	1340	(si,fu)
06/02	F10-4	960	(si,fu)
	F10-5	6170	(si,fu)
06/17	F10-4	5100	(si,fu)
06/19	F10-4	2850	(si,fu)
	F10-5	1710	(si,fu)
06/30	F10-4	3430	(si,fu)
07/02	F10-5	1465	(si,fu)

1993	site	ppm	irr
05/13	F10-3	3872	(si,fu)
05/17	F10-5	2760	(si,fu)
05/18	F10-2	3205	(si,fu)
05/19	F10-3	2810	(si,fu)
05/20	F10-5	422	(si,fu)
07/14	F10-4	6430	(si,fu)
07/14	F10-5	570	(si,fu)
07/28	F10-4	6210	(si,fu)
	F10-5	2395	(si,fu)
07/29	F10	5615	(si,fu)
08/11	F10-4	5445	(si,fu)
	F10-5	960	(si,fu)
08/20	F10-5	746	(si,fu)
08/24	F10	2515	(si,fu)
08/26	F10-4	3285	(si,fu)
	F10-5	2445	(si,fu)
09/08	F10	3366	(si,fu)

1994	site	ppm	irr
06/20	F10-1	49	(si,fu)
	F10-2	4580	(si,fu)
	F10-3	4103	(si,fu)
06/23*	F10PS	67	(si,fu)
	F10PC	4985	(si,fu)
	F10PT	3270	(si,fu)
07/07	F10-1	19	(si,fu)
	F10-2	2270	(si,fu)
	F10-3	3735	(si,fu)
	F10-4	1363	(si,fu)
	F10-5	383	(si,fu)
	F10-6	670	(si,fu)
07/22	F10SW	159	(si,fu)
	F10-3	4685	(si,fu)
	F10-4	4085	(si,fu)
	F10-5	3695	(si,fu)
	F10-6	2985	(si,fu)
07/26	F10-2	3677	(si,fu)
	F10-6	132	(si,fu)
08/04	F10-1	35	(si,fu)
	F10-2	3810	(si,fu)
08/05	F10-4	5060	(si,fu)
	F10-5	3710	(si,fu)
	F10-6	2805	(si,fu)
08/22	F10-6	313	(si,fu)

Field 11:

1992	site	ppm	irr
04/20	F10-6	5	(si,bo)

1993	site	ppm	irr
	none		

1994	site	ppm	irr
	none		

Field 12:

1992	site	ppm	irr
07/13	F12-1	865	(si,fl)
08/10	F12-1	93	(si,fl)

1993	site	ppm	irr
07/07	F12-1	73	(NA,fl)
08/02	F12-1	1086	(NA,fl)
09/03	F12-1	3295	(NA,fl)

1994	site	ppm	irr
	none		

Field 13:

1992	site	ppm	irr
	none		

1993	site	ppm	irr
09/13	F13	90	(NA,fl)

1994	site	ppm	irr
	none		

APPENDIX J: **TOTAL SUSPENDED SOLIDS (TSS*)** continued

Field 14:

1992	site	ppm	irr	1993	site	ppm	irr	1994	site	ppm	irr
04/20	F14-1	62	(si,fl)	08/05	F14-1	5	(NA,fl)	06/03	F14-1	1194	(ga,fl)
08/12	F14-1	37	(si,fl)	09/09	F14-1	3	(NA,fl)				

Field 15:

1992	site	ppm	irr	1993	site	ppm	irr	1994	site	ppm	irr
08/11	F15-1	88	(si,fl)	06/10	F15-1	40	(NA,fl)	07/14	F15-1	755	(si,fu)
				08/05	F15-1	24	(NA,fl)	07/15	F15THD	322	(si,fu)
									F15-1	101	(si,fu)
								07/28	F15-1	661	(si,fu)
								08/02	F15-1	358	(si,fu)
								08/18	F15-1	543	(si,fu)

Field 16:

1992	site	ppm	irr	1993	site	ppm	irr	1994	site	ppm	irr
08/18	F16-1	284	(si,fl)	06/14	F16-1	28	(NA,fl)	06/22	F16-1	1146	(si,fu)
08/21	F16-1	29	(si,fl)	09/13	F16-1	36	(NA,fl)	07/11	F16-1	284	(si,fu)
								07/13	F16-1	880	(si,fu)
								07/28	F16-1	362	(si,fu)
								08/15	F16SW	1125	(si,fu)
									F16-1	247	(si,fu)

Key to Abbreviations

B: bottom block of field
BHD: bottom head ditch
(bo): border irrigation
BP: by-pass field sump
C: center block of field
E: East
FS: field sump
(fl): flood irrigation
(fu): furrow irrigation
(ga): gated pipe application
HD: head ditch
HDR: return system head ditch
MHD: mid-field head ditch
MDD: mid-field drain ditch
MS: main sump
N: North
(NA): not available
RS: return system
S: South
(si): siphon pipe application
SI: sump inflow
SO: sump outflow
(sp): sprinkler application
SW: source water
T: top block of field
TDD: top drain ditch
THD: top head ditch
TW: tailwater
VFS: vegetative filter strip
W: West
*: polymer trial data

TAB

Appendix K

APPENDIX K: AVERAGE TSS LEAVING FIELDS
(in mg/L)

Field	1992	1993	1994	3 Year Average
1	5340	231	2409	2660
2	338	ND	1557	948
3	4853	1816	407	2359
4	1975	1121	2172	1756
5	3166	2698	ND	2932
6	3318	1429	1309	2019
7	ND	ND	2119	2119
8	425	1101	1063	863
9	828	114	18	320
10	3098	5343	3503	3981
11	ND	ND	ND	ND
12	479	1485	ND	982
13	ND	90	ND	90
14	50	4	1194	416
15	88	32	484	201
16	157	32	584	258
Field Average	1855	1192	1402	1483
Main Sump Outflow	200	144	100	148
Reduction %	89%	88%	93%	90%

ND = no TSS determinations were made

TAB

Appendix L

APPENDIX L: FUSED PREDICTIONS BY CROP
(in potential tons of sediment)

Crop	1992	1993	1994	3 Year Total
Alfalfa				
planted acreage	94	207	228	529
tons/acre	0	0	0	0
potential total	0	0	0	0
Beans, Green				
planted acreage	NP	NP	123	123
potential tons/acre	-	-	2.20	2.20
potential total	-	-	270.6	270.6
Beans, Dry Lima				
planted acreage	116	163	544	823
potential tons/acre	0.5	0.80	0.86	0.72
potential total	58.0	130.4	469.7	658.1
Corn, Silage				
planted acreage	NP	452	164	616
potential tons/acre	-	0.30	0.31	0.30
potential total	-	134.8	51.6	186.4
Oats				
planted acreage	NP	15	63	78
potential tons/acre	-	0	0	0
potential total	-	0	0	0
Sugar Beets				
planted acreage	40	NP	NP	40
potential tons/acre	0.40	-	-	0.40
potential total	16.0	-	-	16.0
Tomatoes				
planted acreage	509	NP	NP	509
potential tons/acre	0.53	-	-	0.53
potential total	268.6	-	-	268.6
Wheat				
planted acreage	300	285	NP	585
potential tons/acre	0	0	-	0
potential total	0	0	-	0
Potential Sediment	342.6	265.2	791.9	1,399.7

NP = crop was not planted

TAB

Appendix M

APPENDIX M: FUSED PREDICTIONS BY FIELD
(in potential tons of sediment)

Field	1990	1991	1992	1993	1994	5 Year Total
1	0	9.7	0	8.4	8.4	26.5
2	0	14.5	0	0	32.4	46.9
3	15.0	10.6	5.3	10.6	0	41.5
4	11.5	20.0	58.0	23.2	104.4	217.1
5	48.0	0	67.2	38.4	0	153.6
6	38.4	0	19.2	33.6	33.6	124.8
7	110.7	36.9	0	0	270.6	418.2
8	0	4.0	16.0	20.6	72.1	112.7
9	169.5	22.6	79.1	0	0	271.2
10	0	16.3	97.8	130.4	260.8	505.3
11	0	0	0	0	0	0
12	2.9	0	0	0	0	2.9
13	1.5	0	0	0	0	1.5
14	1.5	0	0	0	0	1.5
15	5.6	0	0	0	4.0	9.6
16	5.6	0	0	0	5.6	11.2
Potential Total Sediment	410.2	134.6	342.6	265.2	791.9	1,944.5

TAB

Appendix N

APPENDIX N: PESTICIDE PROPERTIES
of chemicals applied to NALF fields

Trade Name	Common Name	Solubility (ppm)	Koc Value	Half-life (days)
Herbicides				
Sonalan	Ethalfluralin	0.2(E)	471,000	60(E)
Weed Killer 66	2,4-D Amine	50(E)	1,000(E)	10
Weedar	MCPA Salt	270,000	20(E)	14
Insecticides				
Asana	Esfenvalerate	0.1(E)	100,000(E)	50(E)
Comite	Propargite	0.5	8,000(E)	20(G)
Cygon (OP)	Dimethoate	25,000	8	7
Kelthane (OC)	Dicofol	1(E)	8,000,000	60(G)
Lannate (C)	Methomyl	57,900	28(E)	8
Lorsban (OP)	Chlorpyrifos	2	6,070	30
Monitor (OP)	Methamidophos	100,000	780	6
Orthene (OP)	Acephate	650,000	100	3
Sulfur	Sulfur	NA	NA	NA

NA = not applicable

Solubility (E) = estimated value with possible error factor of up to three.
(G) = guess estimate with possible error factor of one or two.

Koc Value (E) = estimated value with probable error factor of 3x - 5x.
(G) = guess estimate with probable error factor of 10x - 100x.

Half-life (E) = estimated value with probable error factor of two or more.
(G) = guess estimate with possible error factor of three or more.

(C) = a carbamate

(OC) = an organochloride

(OP) = an organophosphate

TAB

Appendix O

APPENDIX O: ANALYTICAL RESULTS from Water Sampling at Crows Landing 319 Project - Field & Sampling Sites

LOCATION: Field 1

Analysis	Detection Limit (ug/L)	Tomatoes 08/05/92	Silage Corn 06/17/94	Silage Corn 06/17/94	Silage Corn 06/20/94	Silage Corn 06/20/94	Silage Corn 07/13/94	Silage Corn 07/13/94	Silage Corn 08/12/94
608 - Organochlorines	SCS Sample #	85924	617941	617942	620941	620942	71394F14	71394F1MHD	81294F1S
		(si,fu)	(si,fu)	(si,fu)	(si,fu)	(si,fu)	(si,fu)	(si,fu)	(si,fu)
Alpha-BHC	0.05	ND	ND	ND	ND	ND	ND	ND	ND
Gamma-BHC	0.05	ND	ND	ND	ND	ND	ND	ND	ND
Heptachlor	0.05	ND	ND	ND	ND	ND	ND	ND	ND
Beta-BHC	0.05	ND	ND	ND	ND	ND	ND	ND	ND
Delta-BHC	0.05	ND	ND	ND	ND	ND	ND	ND	ND
Aldrin	0.05	**0.09**	ND	ND	ND	ND	ND	ND	ND
Heptachlor Epoxide	0.05	ND	ND	ND	ND	ND	ND	ND	ND
Endosulfan 1	0.05	ND	ND	ND	ND	ND	ND	ND	ND
p,p'-DDE	0.05	**0.05**	ND	ND	ND	**0.12**	ND	ND	ND
Dieldrin	0.05	ND	ND	ND	ND	ND	ND	ND	ND
Endrin	0.05	ND	ND	ND	ND	ND	ND	ND	ND
p,p'-DDD	0.05	ND	ND	ND	ND	ND	ND	ND	ND
Endosulfan 2	0.05	ND	ND	ND	ND	ND	ND	ND	ND
p,p'-DDT	0.05	**0.05**	ND	ND	ND	**0.09**	ND	ND	ND
Endrin Aldehyde	0.1	ND	ND	ND	ND	ND	ND	ND	ND
Endosulfan Sulfate	0.1	ND	ND	ND	ND	ND	ND	ND	ND
Methoxychlor	0.5	ND	ND	ND	ND	ND	ND	ND	ND
Toxaphene	1.0	**1.2**	ND	ND	ND	ND	ND	ND	ND
Chlordane	0.2	ND	ND	ND	ND	ND	ND	ND	ND
o,p'-DDT	0.05	ND	ND	ND	ND	ND	ND	ND	ND
o,p'-DDE	0.05	-	-	-	-	-	-	-	-
o,p'-DDD	0.05	-	-	-	-	-	-	-	-
PCB 1016	1.0	ND	ND	ND	ND	ND	ND	ND	ND
PCB 1221	1.0	ND	ND	ND	ND	ND	ND	ND	ND
PCB 1232	1.0	ND	ND	ND	ND	ND	ND	ND	ND
PCB 1242	1.0	ND	ND	ND	ND	ND	ND	ND	ND
PCB 1248	1.0	ND	ND	ND	ND	ND	ND	ND	ND
PCB 1254	1.0	ND	ND	ND	ND	ND	ND	ND	ND
PCB 1260	1.0	ND	ND	ND	ND	ND	ND	ND	ND

NOTES:
ND = none detected
(#) = alternate detection limit
- = not analyzed
(gi) = gated pipe application
(si) = siphon pipe application
(sp) = sprinkler application
(bo) = border irrigation
(fl) = flood irrigation
(fu) = furrow irrigation

APPENDIX O: ANALYTICAL RESULTS from Water Sampling at Crows Landing 319 Project - Field & Sampling Sites continued

LOCATION: Field 1 continued

Analysis	Detection Limit (ug/L)	Silage Corn 08/12/94	Silage Corn 08/15/94						
608 Organochlorines	SCS Sample #	81294F1TW	81594F1VFS						
		(si,fu)	(si,fu)						
Alpha-BHC	0.05	ND	ND						
Gamma-BHC	0.05	ND	ND						
Heptachlor	0.05	ND	ND						
Beta-BHC	0.05	ND	ND						
Delta-BHC	0.05	ND	ND						
Aldrin	0.05	ND	ND						
Heptachlor Epoxide	0.05	ND	ND						
Endosulfan 1	0.05	ND	ND						
p,p'-DDE	0.05	ND	ND						
Dieldrin	0.05	ND	ND						
Endrin	0.05	ND	ND						
p,p'-DDD	0.05	ND	ND						
Endosulfan 2	0.05	ND	ND						
p,p'-DDT	0.05	ND	ND						
Endrin Aldehyde	0.1	ND	ND						
Endosulfan Sulfate	0.1	ND	ND						
Methoxychlor	0.5	ND	0.5						
Toxaphene	1.0	ND	ND						
Chlordane	0.2	ND	ND						
o,p'-DDT	0.05	ND	ND						
o,p'-DDE	0.05	-	-						
o,p'-DDD	0.05	-	-						
PCB 1016	1.0	ND	ND						
PCB 1221	1.0	ND	ND						
PCB 1232	1.0	ND	ND						
PCB 1242	1.0	ND	ND						
PCB 1248	1.0	ND	ND						
PCB 1254	1.0	ND	ND						
PCB 1260	1.0	ND	ND						

NOTES: ND = none detected
(#) = alternate detection limit
\- = not analyzed

(gi) = gated pipe application
(si) = siphon pipe application
(sp) = sprinkler application

(bo) = border irrigation
(fl) = flood irrigation
(fu) = furrow irrigation

APPENDIX O: ANALYTICAL RESULTS from Water Sampling at Crows Landing 319 Project - Field & Sampling Sites continued

LOCATION: Field 1 continued

Analysis	Detection Limit (ug/L)	Tomatoes 08/05/92	Silage Corn 06/17/94	Silage Corn 06/17/94	Silage Corn 06/20/94	Silage Corn 06/20/94	Silage Corn 07/13/94	Silage Corn 08/12/94	Silage Corn 08/12/94
622 - Organophosphates	SCS Sample #	85923	617941	617942	620941	620942	-	81294F1S	81294F1TW
		(si,fu)	(si,fu)	(si,fu)	(si,fu)	(si,fu)		(si,fu)	(si,fu)
TEPP	0.1	ND(0.5)	ND	ND	ND	ND		ND	ND
Dichlorvos	0.1	ND(0.5)	ND	ND	ND	ND		ND	ND
Phosdrin	0.1	ND(1.0)	ND	ND	ND	ND		ND	ND
Prophos	0.1	ND(0.5)	ND	ND	ND	ND		ND	ND
Phorate	0.1	ND(0.5)	ND	ND	ND	ND		ND	ND
Dibrom	0.5	ND	ND	ND	ND	ND		ND	ND
Demeton	0.1	ND(0.5)	ND	ND	ND	ND		ND	ND
Diazinon	0.1	ND(0.5)	ND	ND	ND	ND		ND	ND
Disulfoton	0.1	ND(0.5)	ND	ND	ND	ND		ND	ND
Fenchlorphos	0.1	ND(0.5)	ND	ND	ND	ND		ND	ND
m-Parathion	0.1	ND(0.5)	ND	ND	ND	ND	not	ND	ND
Malathion	0.1	ND(0.5)	ND	ND	ND	ND	analyzed	ND	ND
Chlorpyrifos	0.1	ND(0.5)	ND	ND	ND	ND		ND	ND
Parathion	0.1	ND(0.5)	ND	ND	ND	ND		ND	ND
Fenthion	0.1	ND(0.5)	ND	ND	ND	ND		ND	ND
Merphos	0.1	ND(0.5)	ND	ND	ND	ND		ND	ND
Stirophos	0.1	ND(0.5)	ND	ND	ND	ND		ND	ND
Sulprofos	0.1	ND(0.5)	ND	ND	ND	ND		ND	ND
Fensulfothion	0.5	ND	ND	ND	ND	ND		ND	ND
EPN	0.2	ND(0.5)	ND	ND	ND	ND		ND	ND
Guthion	1.0	ND	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)		ND	ND
Coumaphos	1.0	ND	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)		ND	ND
Dimethoate	0.1	7.3(0.5)	ND	ND	ND	ND		3.7	4.1

NOTES: ND = none detected
(#) = alternate detection limit
- = not analyzed

(gi) = gated pipe application
(si) = siphon pipe application
(sp) = sprinkler application

(bo) = border irrigation
(fl) = flood irrigation
(fu) = furrow irrigation

APPENDIX O: ANALYTICAL RESULTS from Water Sampling at Crows Landing 319 Project - Field & Sampling Sites continued

LOCATION: Field 1 continued

Analysis	Detection Limit (ug/L)	Silage Corn 08/15/94							
622 Organophosphates	SCS Sample #	81594F1VFS							
		(si,fu)							
TEPP	0.1	ND							
Dichlorvos	0.1	ND							
Phosdrin	0.1	ND							
Prophos	0.1	ND							
Phorate	0.1	ND							
Dibrom	0.5	ND							
Demeton	0.1	ND							
Diazinon	0.1	ND							
Disulfoton	0.1	ND							
Fenchlorphos	0.1	ND							
m-Parathion	0.1	ND							
Malathion	0.1	ND							
Chlorpyrifos	0.1	ND							
Parathion	0.1	ND							
Fenthion	0.1	ND							
Merphos	0.1	ND							
Stirophos	0.2	ND							
Sulprofos	0.1	ND							
Fensulfothion	0.5	ND							
EPN	0.2	ND							
Guthion	1.0	ND							
Coumaphos	1.0	ND							
Dimethoate	0.1	1.7							

NOTES:
ND = none detected
(#) = alternate detection limit
- = not analyzed

(gi) = gated pipe application
(si) = siphon pipe application
(sp) = sprinkler application

(bo) = border irrigation
(fl) = flood irrigation
(fu) = furrow irrigation

APPENDIX O: ANALYTICAL RESULTS from Water Sampling at Crows Landing 319 Project - Field & Sampling Sites continued

LOCATION: Field 1 continued

Analysis	Detection Limit (ug/L)	08/05/92	Silage Corn 06/17/94	Silage Corn 06/17/94	Silage Corn 06/20/94	Silage Corn 06/20/94	07/13/94	08/12/94	08/15/94
632 - Carbamates	SCS Sample #	-	617941	617942	620941	620942	-	-	-
			(si,fu)	(si,fu)	(si,fu)	(si,fu)			
Aminocarb	1.0		-	-	-	-			
Barban	6.0		ND	ND	ND	ND			
Carbaryl	6.0		ND	ND	ND	ND			
Carbofuran	25.0		ND	ND	ND	ND			
Chlorpropham	7.0		ND	ND	ND	ND			
Diuron	1.0		ND	ND	ND	ND			
Fenuron	4.0		ND	ND	ND	ND			
Fenuron-TCA	2.0		-	-	-	-			
Fluometuron	3.0	not	ND	ND	ND	ND	not	not	not
Linuron	1.0	analyzed	-	-	-	-	analyzed	analyzed	analyzed
Methiocarb	0.1		-	-	-	-			
Methomyl	7.0		ND	ND	ND	ND			
Mexacarbate	1.0		-	-	-	-			
Monuron	3.0		ND	ND	ND	ND			
Monuron-TCA	1.0		-	-	-	-			
Neburon	2.0		ND	ND	ND	ND			
Oxamyl	3.0		ND	ND	ND	ND			
Propham	7.0		ND	ND	ND	ND			
Propoxur	30.0		ND	ND	ND	ND			
Siduron	3.0		ND	ND	ND	ND			

NOTES:
ND = none detected
(#) = alternate detection limit
\- = not analyzed

(gi) = gated pipe application
(si) = siphon pipe application
(sp) = sprinkler application

(bo) = border irrigation
(fl) = flood irrigation
(fu) = furrow irrigation

APPENDIX O: ANALYTICAL RESULTS from Water Sampling at Crows Landing 319 Project - Field & Sampling Sites continued

LOCATION: Field 4

Analysis	Detection Limit (ug/L)	Dry Limas 08/05/92	Dry Limas 07/15/94	Dry Limas 07/15/94
608 - Organochlorines	SCS Sample #	85922	71594F41	71594F4C
		(si,gi,fu)	(si,fu)	(si,fu)
Alpha-BHC	0.05	ND	ND	ND
Gamma-BHC	0.05	ND	ND	ND
Heptachlor	0.05	ND	ND	ND
Beta-BHC	0.05	ND	ND	ND
Delta-BHC	0.05	ND	ND	ND
Aldrin	0.05	ND	ND	ND
Heptachlor Epoxide	0.05	ND	ND	ND
Endosulfan 1	0.05	ND	ND	ND
p,p'-DDE	0.05	**0.10**	ND	ND
Dieldrin	0.05	ND	ND	ND
Endrin	0.05	ND	ND	ND
p,p'-DDD	0.05	**0.05**	ND	ND
Endosulfan 2	0.05	ND	ND	ND
p,p'-DDT	0.05	**0.10**	ND	ND
Endrin Aldehyde	0.1	ND	ND	ND
Endosulfan Sulfate	0.1	ND	ND	ND
Methoxychlor	0.5	ND	**2.8**	ND
Toxaphene	1.0	**1.8**	ND	ND
Chlordane	0.2	ND	ND	ND
o,p'-DDT	0.05	ND	ND	ND
o,p'-DDE	0.05	-	-	-
o,p'-DDD	0.05	-	-	-
PCB 1016	1.0	ND	ND	ND
PCB 1221	1.0	ND	ND	ND
PCB 1232	1.0	ND	ND	ND
PCB 1242	1.0	ND	ND	ND
PCB 1248	1.0	ND	ND	ND
PCB 1254	1.0	ND	ND	ND
PCB 1260	1.0	ND	ND	ND

NOTES:
ND = none detected
(#) = alternate detection limit
- = not analyzed
(gi) = gated pipe application
(si) = siphon pipe application
(sp) = sprinkler application
(bo) = border irrigation
(fl) = flood irrigation
(fu) = furrow irrigation

APPENDIX O: ANALYTICAL RESULTS from Water Sampling at Crows Landing 319 Project - Field & Sampling Sites continued

LOCATION: Field 4 continued

Analysis	Detection Limit (ug/L)	Dry Limas 08/05/92	Dry Limas 07/15/94	Dry Limas 07/15/94					
622 - Organophosphates	SCS Sample #	85921	7159441	71592F4S					
		(si,gi,fu)	(si,fu)	(si,fu)					
TEPP	0.1	ND(0.5)	ND	ND					
Dichlorvos	0.1	ND(0.5)	ND	ND					
Phosdrin	0.1	ND(1.0)	ND	ND					
Prophos	0.1	ND(0.5)	ND	ND					
Phorate	0.1	ND(0.5)	ND	ND					
Dibrom	0.5	ND	ND	ND					
Demeton	0.1	ND(0.5)	ND	ND					
Diazinon	0.1	ND(0.5)	ND	ND					
Disulfoton	0.1	ND(0.5)	ND	ND					
Fenchlorphos	0.1	ND(0.5)	ND	ND					
m-Parathion	0.1	ND(0.5)	ND	ND					
Malathion	0.1	ND(0.5)	ND	ND					
Chlorpyrifos	0.1	ND(0.5)	ND	ND					
Parathion	0.1	ND(0.5)	ND	ND					
Fenthion	0.1	ND(0.5)	ND	ND					
Merphos	0.1	ND(0.5)	ND	ND					
Stirophos	0.2	ND(0.5)	ND	ND					
Sulprofos	0.1	ND(0.5)	ND	ND					
Fensulfothion	0.5	ND	ND	ND					
EPN	0.2	ND(0.5)	ND	ND					
Guthion	1.0	ND	ND	ND					
Coumaphos	1.0	ND	ND	ND					
Dimethoate	0.1	**16.2(0.5)**	**1.8**	ND					

NOTES: ND = none detected
(#) = alternate detection limit
\- = not analyzed

(gi) = gated pipe application
(si) = siphon pipe application
(sp) = sprinkler application

(bo) = border irrigation
(fl) = flood irrigation
(fu) = furrow irrigation

APPENDIX O: ANALYTICAL RESULTS from Water Sampling at Crows Landing 319 Project - Field & Sampling Sites continued

LOCATION: Field 4 continued

Analysis	Detection Limit (ug/L)	08/05/92	07/15/94						
632 - Carbamates	SCS Sample #	-	-						
Aminocarb	1.0								
Barban	1.0								
Carbaryl	0.1								
Carbofuran	0.2								
Chlorpropham	1.0								
Diuron	1.0								
Fenuron	2.0								
Fenuron-TCA	2.0								
Fluometuron	1.0	not	not						
Linuron	1.0	analyzed	analyzed						
Methiocarb	0.1								
Methomyl	0.1								
Mexacarbate	1.0								
Monuron	1.0								
Monuron-TCA	1.0								
Neburon	1.0								
Oxamyl	0.1								
Propham	5.0								
Propoxur	0.1								
Siduron	10.0								

NOTES:
ND = none detected
(#) = alternate detection limit
- = not analyzed

(gi) = gated pipe application
(si) = siphon pipe application
(sp) = sprinkler application

(bo) = border irrigation
(fl) = flood irrigation
(fu) = furrow irrigation

APPENDIX O: ANALYTICAL RESULTS from Water Sampling at Crows Landing 319 Project - Field & Sampling Sites continued

LOCATION: Field 7

Analysis	Detection Limit (ug/L)	Gr. Beans 08/10/94	Gr. Beans 08/10/94	Gr. Beans 08/29/94	Gr. Beans 08/29/94 (blind)	Gr. Beans 08/31/94	Gr. Beans 09/09/94	Gr. Beans 09/09/94	Gr. Beans 09/09/94
608 - Organochlorines	SCS Sample #	81094F7S	81094S4	82994S4G	82994S3	83194S4S	90994F7TWG	90994F7SWS	90994F7TWS
		(gi,fu)	(gi,fu)	(gi,fu)	(gi,fu)	(si,fu)	(gi,fu)	(si,fu)	(si,fu)
Alpha-BHC	0.05	ND	ND	ND	ND	ND	DN	ND	ND
Gamma-BHC	0.05	ND	ND	ND	ND	ND	ND	ND	ND
Heptachlor	0.05	ND	ND	ND	ND	ND	ND	ND	ND
Beta-BHC	0.05	ND	ND	ND	ND	ND	ND	ND	ND
Delta-BHC	0.05	ND	ND	ND	ND	ND	ND	ND	ND
Aldrin	0.05	ND	ND	ND	ND	ND	ND	ND	ND
Heptachlor Epoxide	0.05	ND	ND	ND	ND	ND	ND	ND	ND
Endosulfan 1	0.05	ND	ND	ND	ND	ND	ND	ND	ND
p,p'-DDE	0.05	ND	0.12	0.05	0.05	0.07	0.10	ND	0.10
Dieldrin	0.05	ND	ND	ND	ND	ND	ND	ND	ND
Endrin	0.05	ND	ND	ND	ND	ND	ND	ND	ND
p,p'-DDD	0.05	ND	ND	ND	ND	ND	ND	ND	ND
Endosulfan 2	0.05	ND	ND	ND	ND	ND	ND	ND	ND
p,p'-DDT	0.05	ND	0.09	0.07	0.06	0.12	0.07	ND	0.07
Endrin Aldehyde	0.1	ND	ND	ND	ND	ND	ND	ND	ND
Endosulfan Sulfate	0.1	ND	ND	ND	ND	ND	ND	ND	ND
Methoxychlor	0.5	ND	ND	ND	ND	ND	ND	ND	ND
Toxaphene	1.0	ND	ND	ND	ND	ND	ND	ND	ND
Chlordane	0.2	ND	ND	ND	ND	ND	ND	ND	ND
o,p'-DDT	0.05	ND	ND	ND	ND	ND	ND	ND	ND
o,p'-DDE	0.05	-	-	-	-	-	-	-	-
o,p'-DDD	0.05	-	-	-	-	-	-	-	-
PCB 1016	1.0	ND	ND	ND	ND	ND	ND	ND	ND
PCB 1221	1.0	ND	ND	ND	ND	ND	ND	ND	ND
PCB 1232	1.0	ND	ND	ND	ND	ND	ND	ND	ND
PCB 1242	1.0	ND	ND	ND	ND	ND	ND	ND	ND
PCB 1248	1.0	ND	ND	ND	ND	ND	ND	ND	ND
PCB 1254	1.0	ND	ND	ND	ND	ND	ND	ND	ND
PCB 1260	1.0	ND	ND	ND	ND	ND	ND	ND	ND

NOTES: ND = none detected
(#) = alternate detection limit
- = not analyzed

(gi) = gated pipe application
(si) = siphon pipe application
(sp) = sprinkler application

(bo) = border irrigation
(fl) = flood irrigation
(fu) = furrow irrigation

APPENDIX O: ANALYTICAL RESULTS from Water Sampling at Crows Landing 319 Project - Field & Sampling Sites continued

LOCATION: Field 7 continued

Analysis	Detection Limit (ug/L)	Gr. Beans 08/10/94	Gr. Beans 08/10/94	Gr. Beans 08/29/94	Gr. Beans 08/29/94	Gr. Beans 08/31/94	Gr. Beans 09/09/94	Gr. Beans 09/09/94	Gr. Beans 09/09/94
					(blind)				
622 - Organophosphates	SCS Sample #	81094F7S	81094S4	82994S4G	82994S3	83194S4S	90994F7TWG	90994F7SWS	90994F7TWS
		(gi,fu)	(gi,fu)	(gi,fu)	(gi,fu)	(si,fu)	(gi,fu)	(si,fu)	(si,fu)
TEPP	0.1	ND	ND	ND	ND	ND	ND	ND	ND
Dichlorvos	0.1	ND	ND	ND	ND	ND	ND	ND	ND
Phosdrin	0.1	ND	ND	ND	ND	ND	ND	ND	ND
Prophos	0.1	ND	ND	ND	ND	ND	ND	ND	ND
Phorate	0.1	ND	ND	ND	ND	ND	ND	ND	ND
Dibrom	0.5	ND	ND	ND	ND	ND	ND	ND	ND
Demeton	0.1	ND	ND	ND	ND	ND	ND	ND	ND
Diazinon	0.1	ND	ND	ND	ND	ND	ND	ND	ND
Disulfoton	0.1	ND	ND	ND	ND	ND	ND	ND	ND
Fenchlorphos	0.1	ND	ND	ND	ND	ND	ND	ND	ND
m-Parathion	0.1	ND	ND	ND	ND	ND	ND	ND	ND
Malathion	0.1	ND	ND	ND	ND	ND	ND	ND	ND
Chlorpyrifos	0.1	ND	ND	ND	ND	ND	ND	ND	ND
Parathion	0.1	ND	ND	ND	ND	ND	ND	ND	ND
Fenthion	0.1	ND	ND	ND	ND	ND	ND	ND	ND
Merphos	0.1	ND	ND	ND	ND	ND	ND	ND	ND
Stirophos	0.2	ND	ND	ND	ND	ND	ND	ND	ND
Sulprofos	0.1	ND	ND	ND	ND	ND	ND	ND	ND
Fensulfothion	0.5	ND	ND	ND	ND	ND	ND	ND	ND
EPN	0.2	ND	ND	ND	ND	ND	ND	ND	ND
Guthion	1.0	ND	ND	ND	ND	ND	ND	ND	ND
Coumaphos	1.0	ND	ND	ND	ND	ND	ND	ND	ND
Dimethoate	0.1	ND	0.3	11.3	13.4	15.8	0.3	ND	ND

NOTES:
ND = none detected
(#) = alternate detection limit
\- = not analyzed

(gi) = gated pipe application
(si) = siphon pipe application
(sp) = sprinkler application

(bo) = border irrigation
(fl) = flood irrigation
(fu) = furrow irrigation

APPENDIX O: ANALYTICAL RESULTS from Water Sampling at Crows Landing 319 Project - Field & Sampling Sites continued

LOCATION: Field 7 continued

Analysis	Detection Limit (ug/L)	Gr. Beans 08/10/94	Gr. Beans 08/10/94	08/29/94	08/31/94	09/09/94			
632 - Carbamates	SCS Sample #	81094F7S	81094S4	-	-	-			
		(gi,fu)	(gi,fu)						
Aminocarb	1.0	-	-						
Barban	6.0	ND	ND						
Carbaryl	6.0	ND	ND						
Carbofuran	25.0	ND	ND						
Chlorpropham	7.0	ND	ND						
Diuron	1.0	ND	ND						
Fenuron	4.0	ND	ND						
Fenuron-TCA	2.0	-	-						
Fluometuron	3.0	ND	ND	not	not	not			
Linuron	1.0	-	-	analyzed	analyzed	analyzed			
Methiocarb	0.1	-	-						
Methomyl	7.0	ND	ND						
Mexacarbate	1.0	-	-						
Monuron	3.0	ND	ND						
Monuron-TCA	1.0	-	-						
Neburon	2.0	ND	ND						
Oxamyl	3.0	ND	ND						
Propham	7.0	ND	ND						
Propoxur	30.0	ND	ND						
Siduron	3.0	ND	ND						

NOTES:
ND = none detected
(#) = alternate detection limit
\- = not analyzed

(gi) = gated pipe application
(si) = siphon pipe application
(sp) = sprinkler application

(bo) = border irrigation
(fl) = flood irrigation
(fu) = furrow irrigation

APPENDIX O: ANALYTICAL RESULTS from Water Sampling at Crows Landing 319 Project - Field & Sampling Sites continued

LOCATION: Field 9

Analysis	Detection Limit (ug/L)	Alfalfa 07/11/94	Alfalfa 07/11/94
608 - Organochlorines	SCS Sample #	711949S	7119492
		(gi,fl)	(gi,fl)
Alpha-BHC	0.05	ND	ND
Gamma-BHC	0.05	ND	ND
Heptachlor	0.05	ND	ND
Beta-BHC	0.05	ND	ND
Delta-BHC	0.05	ND	ND
Aldrin	0.05	ND	ND
Heptachlor Epoxide	0.05	ND	ND
Endosulfan 1	0.05	ND	ND
p,p'-DDE	0.05	ND	ND
Dieldrin	0.05	ND	ND
Endrin	0.05	ND	ND
p,p'-DDD	0.05	ND	ND
Endosulfan 2	0.05	ND	ND
p,p'-DDT	0.05	ND	0.05
Endrin Aldehyde	0.1	ND	ND
Endosulfan Sulfate	0.1	ND	ND
Methoxychlor	0.5	ND	ND
Toxaphene	1.0	ND	ND
Chlordane	0.2	ND	ND
o,p'-DDT	0.05	ND	ND
o,p'-DDE	0.05	-	-
o,p'-DDD	0.05	-	-
PCB 1016	1.0	ND	ND
PCB 1221	1.0	ND	ND
PCB 1232	1.0	ND	ND
PCB 1242	1.0	ND	ND
PCB 1248	1.0	ND	ND
PCB 1254	1.0	ND	ND
PCB 1260	1.0	ND	ND

NOTES:
ND = none detected
(#) = alternate detection limit
- = not analyzed
(gi) = gated pipe application
(si) = siphon pipe application
(sp) = sprinkler application
(bo) = border irrigation
(fl) = flood irrigation
(fu) = furrow irrigation

APPENDIX O: ANALYTICAL RESULTS from Water Sampling at Crows Landing 319 Project - Field & Sampling Sites continued

LOCATION: Field 9 continued

Analysis	Detection Limit (ug/L)	Alfalfa 07/11/94	Alfalfa 07/11/94						
622 - Organophosphates	SCS Sample #	711949S	7119492						
		(gi,fl)	(gi,fl)						
TEPP	0.1	ND	ND						
Dichlorvos	0.1	ND	ND						
Phosdrin	0.1	ND	ND						
Prophos	0.1	ND	ND						
Phorate	0.1	ND	ND						
Dibrom	0.5	ND	ND						
Demeton	0.1	ND	ND						
Diazinon	0.1	ND	ND						
Disulfoton	0.1	ND	ND						
Fenchlorphos	0.1	ND	ND						
m-Parathion	0.1	ND	ND						
Malathion	0.1	ND	ND						
Chlorpyrifos	0.1	ND	ND						
Parathion	0.1	ND	ND						
Fenthion	0.1	ND	ND						
Merphos	0.1	ND	ND						
Stirophos	0.2	ND	ND						
Sulprofos	0.1	ND	ND						
Fensulfothion	0.5	ND	ND						
EPN	0.2	ND	ND						
Guthion	1.0	ND	ND						
Coumaphos	1.0	ND	ND						
Dimethoate	0.1	ND	ND						

NOTES:
ND = none detected
(#) = alternate detection limit
- = not analyzed

(gi) = gated pipe application
(si) = siphon pipe application
(sp) = sprinkler application

(bo) = border irrigation
(fl) = flood irrigation
(fu) = furrow irrigation

APPENDIX O: ANALYTICAL RESULTS from Water Sampling at Crows Landing 319 Project - Field & Sampling Sites continued

LOCATION: Field 9 continued

Analysis	Detection Limit (ug/L)	Alfalfa 07/11/94	Alfalfa 07/11/94						
632 - Carbamates	SCS Sample #	711949S	711942						
		(gi,fl)	(gi,fl)						
Aminocarb	1.0	-	-						
Barban	6.0	ND	ND						
Carbaryl	6.0	ND	ND						
Carbofuran	25.0	ND	ND						
Chlorpropham	7.0	ND	ND						
Diuron	1.0	ND	ND						
Fenuron	4.0	ND	ND						
Fenuron-TCA	2.0	-	-						
Fluometuron	3.0	ND	ND						
Linuron	1.0	-	-						
Methiocarb	0.1	-	-						
Methomyl	7.0	ND	ND						
Mexacarbate	1.0	-	-						
Monuron	3.0	ND	ND						
Monuron-TCA	1.0	-	-						
Neburon	2.0	ND	ND						
Oxamyl	3.0	ND	ND						
Propham	7.0	ND	ND						
Propoxur	30.0	ND	ND						
Siduron	3.0	ND	ND						

NOTES:
ND = none detected
(#) = alternate detection limit
- = not analyzed

(gi) = gated pipe application
(si) = siphon pipe application
(sp) = sprinkler application

(bo) = border irrigation
(fl) = flood irrigation
(fu) = furrow irrigation

APPENDIX O: **ANALYTICAL RESULTS from Water Sampling at Crows Landing 319 Project - Field & Sampling Sites** continued

LOCATION: Field 10

Analysis	Detection Limit (ug/L)	Dry Limas 07/14/93	Dry Limas 07/14/93						
608 - Organochlorines	SCS Sample #	714931A	714932A						
		(si,fu)	(si,fu)						
Alpha-BHC	0.05	ND	ND						
Gamma-BHC	0.05	ND	ND						
Heptachlor	0.05	ND	ND						
Beta-BHC	0.05	ND	ND						
Delta-BHC	0.05	ND	ND						
Aldrin	0.05	ND	ND						
Heptachlor Epoxide	0.05	ND	ND						
Endosulfan 1	0.05	ND	ND						
p,p'-DDE	0.05	**0.20**	**0.14**						
Dieldrin	0.05	ND	ND						
Endrin	0.05	ND	ND						
p,p'-DDD	0.05	ND	ND						
Endosulfan 2	0.05	ND	ND						
p,p'-DDT	0.05	**0.17**	**0.14**						
Endrin Aldehyde	0.1	ND	ND						
Endosulfan Sulfate	0.1	ND	ND						
Methoxychlor	0.5	ND	ND						
Toxaphene	1.0	ND	ND						
Chlordane	0.2	ND	ND						
o,p'-DDT	0.05	ND	ND						
o,p'-DDE	0.05	ND	ND						
o,p'-DDD	0.05	ND	ND						
PCB 1016	1.0	ND	ND						
PCB 1221	1.0	ND	ND						
PCB 1232	1.0	ND	ND						
PCB 1242	1.0	ND	ND						
PCB 1248	1.0	ND	ND						
PCB 1254	1.0	ND	ND						
PCB 1260	1.0	ND	ND						

NOTES: ND = none detected
(#) = alternate detection limit
\- = not analyzed

(gi) = gated pipe application
(si) = siphon pipe application
(sp) = sprinkler application

(bo) = border irrigation
(fl) = flood irrigation
(fu) = furrow irrigation

APPENDIX O: ANALYTICAL RESULTS from Water Sampling at Crows Landing 319 Project - Field & Sampling Sites continued

LOCATION: Field 10 continued

Analysis	Detection Limit (ug/L)	Dry Limas 07/14/93	Dry Limas 07/14/93						
622 - Organophosphates	SCS Sample #	714931B	714932B						
		(si,fu)	(si,fu)						
TEPP	0.1	ND	ND						
Dichlorvos	0.1	ND	ND						
Phosdrin	0.1	ND	ND						
Prophos	0.1	ND	ND						
Phorate	0.1	ND	ND						
Dibrom	0.5	ND	ND						
Demeton	0.1	ND	ND						
Diazinon	0.1	ND	ND						
Disulfoton	0.1	ND	ND						
Fenchlorphos	0.1	ND	ND						
m-Parathion	0.1	ND	ND						
Malathion	0.1	ND	ND						
Chlorpyrifos	0.1	ND	ND						
Parathion	0.1	ND	ND						
Fenthion	0.1	ND	ND						
Merphos	0.1	ND	ND						
Stirophos	0.2	ND	ND						
Sulprofos	0.1	ND	ND						
Fensulfothion	0.5	ND	ND						
EPN	0.2	ND	ND						
Guthion	1.0	ND	ND						
Coumaphos	1.0	ND	ND						
Dimethoate	0.1	1.0	1.1						

NOTES:
ND = none detected
(#) = alternate detection limit
\- = not analyzed

(gi) = gated pipe application
(si) = siphon pipe application
(sp) = sprinkler application

(bo) = border irrigation
(fl) = flood irrigation
(fu) = furrow irrigation

APPENDIX O: ANALYTICAL RESULTS from Water Sampling at Crows Landing 319 Project - Field & Sampling Sites

LOCATION: Field 10 continued

Analysis	Detection Limit (ug/L)	07/14/93							
632 - Carbamates	SCS Sample #	-							
Aminocarb	1.0								
Barban	1.0								
Carbaryl	0.1								
Carbofuran	0.2								
Chlorpropham	1.0								
Diuron	1.0								
Fenuron	2.0								
Fenuron-TCA	2.0								
Fluometuron	1.0	not							
Linuron	1.0	analyzed							
Methiocarb	0.1								
Methomyl	0.1								
Mexacarbate	1.0								
Monuron	1.0								
Monuron-TCA	1.0								
Neburon	1.0								
Oxamyl	0.1								
Propham	5.0								
Propoxur	0.1								
Siduron	10.0								

NOTES:
ND = none detected
(#) = alternate detection limit
- = not analyzed

(gi) = gated pipe application
(si) = siphon pipe application
(sp) = sprinkler application

(bo) = border irrigation
(fl) = flood irrigation
(fu) = furrow irrigation

APPENDIX O: ANALYTICAL RESULTS from Water Sampling at Crows Landing 319 Project - Field & Sampling Sites

LOCATION: Site 1 (NALF exit point)

Analysis	Detection Limit (ug/L)	06/10/92	06/10/92	01/13/93	07/14/93	08/26/94	06/22/94	01/10/95	01/10/95
				(Storm)				(Storm)	(Storm)
608 - Organochlorines	SCS Sample #	610921	610922	113933	714933A	826932	62294S1	11095S1	11095S3
			(blind)						(blind)
Alpha-BHC	0.05	ND	ND	ND	ND	ND	ND	ND	ND
Gamma-BHC	0.05	ND	ND	ND	ND	ND	ND	ND	ND
Heptachlor	0.05	ND	ND	ND	ND	ND	ND	ND	ND
Beta-BHC	0.05	ND	ND	ND	ND	ND	ND	ND	ND
Delta-BHC	0.05	ND	ND	ND	ND	ND	ND	ND	ND
Aldrin	0.05	ND	ND	ND	ND	ND	ND	ND	ND
Heptachlor Epoxide	0.05	ND	ND	ND	ND	ND	ND	ND	ND
Endosulfan 1	0.05	ND	ND	ND	**0.06**	**0.08**	ND	ND	**0.06**
p,p'-DDE	0.05	ND	ND	ND	ND	ND	ND	ND	ND
Dieldrin	0.05	ND	ND	ND	ND	ND	ND	ND	ND
Endrin	0.05	ND	ND	ND	ND	ND	ND	ND	ND
p,p'-DDD	0.05	ND	ND	ND	ND	ND	ND	ND	ND
Endosulfan 2	0.05	ND	ND	ND	**0.08**	ND	ND	**0.15**	**0.16**
p,p'-DDT	0.05	ND	ND	ND	ND	ND	ND	ND	ND
Endrin Aldehyde	0.1	ND	ND	ND	ND	ND	ND	ND	ND
Endosulfan Sulfate	0.1	ND	ND	ND	ND	ND	ND	ND	ND
Methoxychlor	0.5	ND	ND	ND	ND	ND	ND	ND	ND
Toxaphene	1.0	ND	ND	ND	ND	ND	ND	ND	ND
Chlordane	0.2	ND	ND	ND	ND	ND	ND	**0.06**	ND
o,p'-DDT	0.05	ND	ND	ND	ND	ND	-	ND	ND
o,p'-DDE	0.05	-	-	-	ND	ND	-	**0.54**	**0.58**
o,p'-DDD	0.05	-	-	-	ND	ND	-	ND	ND
PCB 1016	1.0	ND	ND	ND	ND	ND	ND	ND	ND
PCB 1221	1.0	ND	ND	ND	ND	ND	ND	ND	ND
PCB 1232	1.0	ND	ND	ND	ND	ND	ND	ND	ND
PCB 1242	1.0	ND	ND	ND	ND	ND	ND	ND	ND
PCB 1248	1.0	ND	ND	ND	ND	ND	ND	ND	ND
PCB 1254	1.0	ND	ND	ND	ND	ND	ND	ND	ND
PCB 1260	1.0	ND	ND	ND	ND	ND	ND	ND	ND

NOTES: ND = none detected
( ) = alternate detection limit
- = not analyzed

APPENDIX O: ANALYTICAL RESULTS from Water Sampling at Crows Landing 319 Project - Field & Sampling Sites continued

LOCATION: Site 1 continued

Analysis	Detection Limit (ug/L)	06/10/92	06/10/92	01/13/93	07/14/93	08/26/93	06/22/94	01/10/95	01/10/95
				(Storm)				(Storm)	(Storm)
622 - Organophosphates	SCS Sample #	610921	610922	113931	714933B	826932	62294S1	11095S1	11095S3
			(blind)						(blind)
TEPP	0.1	ND(0.5)	ND(0.5)	ND	ND	ND	ND	ND	ND
Dichlorvos	0.1	ND(0.5)	ND(0.5)	ND	ND	ND	ND	ND	ND
Phosdrin	0.1	ND(1.0)	ND(1.0)	ND	ND	ND	ND	ND	ND
Prophos	0.1	ND(0.5)	ND(0.5)	ND	ND	ND	ND	ND	ND
Phorate	0.1	ND(0.5)	ND(0.5)	ND	ND	ND	ND	ND	ND
Dibrom	0.5	ND	ND	ND	ND	ND	ND	ND	ND
Demeton	0.1	ND(0.5)	ND(0.5)	ND	ND	ND	ND	ND	ND
Diazinon	0.1	ND(0.5)	ND(0.5)	ND	ND	ND	ND	ND	ND
Disulfoton	0.1	ND(0.5)	ND(0.5)	ND	ND	ND	ND	ND	ND
Fenchlorphos	0.1	ND(0.5)	ND(0.5)	ND	ND	ND	ND	ND	ND
m-Parathion	0.1	ND(0.5)	ND(0.5)	ND	ND	ND	ND	ND	ND
Malathion	0.1	ND(0.5)	ND(0.5)	ND	ND	ND	ND	ND	ND
Chlorpyrifos	0.1	ND(0.5)	ND(0.5)	ND	ND	ND	ND	ND	ND
Parathion	0.1	ND(0.5)	ND(0.5)	ND	ND	ND	ND	ND	ND
Fenthion	0.1	ND(0.5)	ND(0.5)	ND	ND	ND	ND	ND	ND
Merphos	0.1	ND(0.5)	ND(0.5)	ND	ND	ND	ND	ND	ND
Stirophos	0.2	ND(0.5)	ND(0.5)	ND	ND	ND	ND(0.1)	ND	ND
Sulprofos	0.1	ND(0.5)	ND(0.5)	ND	ND	ND	ND	ND	ND
Fensulfothion	0.5	ND	ND	ND	ND	ND	ND	ND	ND
EPN	0.2	ND(0.5)	ND(0.5)	ND	ND	ND	ND	ND	ND
Guthion	1.0	ND(0.5)	ND(0.5)	ND	ND	ND	ND(0.5)	ND	ND
Coumaphos	1.0	ND	ND	ND	ND	ND	ND(0.5)	ND	ND
Dimethoate	0.1	ND(0.5)	ND(0.5)	ND	0.5	ND	ND	ND	ND

NOTES: ND = none detected
( ) = alternate detection limit
\- = not analyzed

APPENDIX O: ANALYTICAL RESULTS from Water Sampling at Crows Landing 319 Project - Field & Sampling Sites continued

LOCATION: Site 1 continued

Analysis	Detection Limit (ug/L)	06/10/92	06/10/92	01/13/93	01/13/93	08/26/93	06/22/94	01/10/95	01/10/95
				(Storm)	(Storm)			(Storm)	(Storm)
632 - Carbamates	SCS Sample #	610921	610922	113932	113934	826932	62294S1	11095S1	11095S3
			(blind)		(blind)				(blind)
Aminocarb	1.0	ND	ND	ND	ND	ND	-	-	-
Barban	1.0	ND	ND	ND	ND	ND	ND(6.0)	ND(6.0)	ND(6.0)
Carbaryl	0.1	ND	ND	ND	ND	ND	ND(6.0)	ND(6.0)	ND(6.0)
Carbofuran	0.2	ND	ND	ND	ND	ND	ND(25.0)	ND(25.0)	ND(25.0)
Chlorpropham	1.0	1.0	1.0	ND	ND	ND	ND(7.0)	ND(7.0)	ND(7.0)
Diuron	1.0	1.5	1.5	7.3	6.8	ND	ND	6.5	5.9
Fenuron	2.0	ND	ND	ND	ND	ND	ND(4.0)	ND(4.0)	ND(4.0)
Fenuron-TCA	2.0	ND	ND	ND	ND	ND	-	-	-
Fluometuron	1.0	ND	ND	ND	ND	ND	ND(3.0)	ND(3.0)	ND(3.0)
Linuron	1.0	ND	ND	ND	ND	ND	-	ND	ND
Methiocarb	0.1	ND	ND	ND	ND	ND	-	-	-
Methomyl	0.1	ND	ND	ND	ND	ND	ND(7.0)	ND(7.0)	ND(7.0)
Mexacarbate	1.0	ND	ND	ND	ND	ND	-	-	-
Monuron	1.0	ND	ND	ND	ND	ND	ND(3.0)	ND(3.0)	ND(3.0)
Monuron-TCA	1.0	ND	ND	ND	ND	ND	-	-	-
Neburon	1.0	ND	ND	ND	ND	ND	ND(2.0)	ND(2.0)	ND(2.0)
Oxamyl	0.1	ND	ND	ND	ND	ND	ND(3.0)	ND(3.0)	ND(3.0)
Propham	5.0	ND	ND	ND	ND	ND	ND(7.0)	ND(7.0)	ND(7.0)
Propoxur	0.1	ND	ND	ND	ND	ND	ND(30.0)	ND(30.0)	ND(30.0)
Siduron	10.0	ND	ND	ND	ND	ND	ND(3.0)	ND(3.0)	ND(3.0)

NOTES: ND = none detected
( ) = alternate detection limit
- = not analyzed

APPENDIX O: ANALYTICAL RESULTS from Water Sampling at Crows Landing 319 Project - Field & Sampling Sites continued

LOCATION: Site 2 (inflow to main sump)

Analysis	Detection Limit (ug/L)	06/22/94	06/22/94	01/10/95
				(Storm)
608 - Organochlorines	SCS Sample #	62294S2	62294S3	11095S2
			(blind)	
Alpha-BHC	0.05	ND	ND	ND
Gamma-BHC	0.05	ND	ND	ND
Heptachlor	0.05	ND	ND	ND
Beta-BHC	0.05	ND	ND	ND
Delta-BHC	0.05	ND	ND	ND
Aldrin	0.05	ND	ND	ND
Heptachlor Epoxide	0.05	ND	ND	ND
Endosulfan 1	0.05	ND	ND	ND
p,p'-DDE	0.05	**0.06**	**0.07**	**0.06**
Dieldrin	0.05	ND	ND	ND
Endrin	0.05	ND	ND	ND
p,p'-DDD	0.05	ND	ND	ND
Endosulfan 2	0.05	ND	ND	ND
p,p'-DDT	0.05	ND	**0.06**	**0.15**
Endrin Aldehyde	0.1	ND	ND	ND
Endosulfan Sulfate	0.1	ND	ND	ND
Methoxychlor	0.5	**1.7**	**1.9**	ND
Toxaphene	1.0	ND	ND	ND
Chlordane	0.2	ND	ND	ND
o,p'-DDT	0.05	ND	ND	**0.06**
o,p'-DDE	0.05	-	-	ND
o,p'-DDD	0.05	-	-	**0.06**
PCB 1016	1.0	ND	ND	ND
PCB 1221	1.0	ND	ND	ND
PCB 1232	1.0	ND	ND	ND
PCB 1242	1.0	ND	ND	ND
PCB 1248	1.0	ND	ND	ND
PCB 1254	1.0	ND	ND	ND
PCB 1260	1.0	ND	ND	ND

NOTES: ND = none detected
( ) = alternate detection limit
- = not analyzed

APPENDIX O: ANALYTICAL RESULTS from Water Sampling at Crows Landing 319 Project - Field & Sampling Sites continued

LOCATION: Site 2 continued

Analysis	Detection Limit (ug/L)	06/22/94	06/22/94	01/10/95					
				(Storm)					
622 - Organophosphates	SCS Sample #	62294S2	62294S3	11095S2					
			(blind)						
TEPP	0.1	ND	ND	ND					
Dichlorvos	0.1	ND	ND	ND					
Phosdrin	1.0	ND	ND	ND					
Prophos	0.1	ND	ND	ND					
Phorate	0.1	ND	ND	ND					
Dibrom	0.5	ND	ND	ND					
Demeton	0.1	ND	ND	ND					
Diazinon	0.1	ND	ND	ND					
Disulfoton	0.1	ND	ND	ND					
Fenchlorphos	0.1	ND	ND	ND					
m-Parathion	0.1	ND	ND	ND					
Malathion	0.1	ND	ND	ND					
Chlorpyrifos	0.1	ND	ND	ND					
Parathion	0.1	ND	ND	ND					
Fenthion	0.1	ND	ND	ND					
Merphos	0.1	ND	ND	ND					
Stirophos	0.1	ND	ND	ND					
Sulprofos	0.1	ND	ND	ND					
Fensulfothion	0.5	ND	ND	ND					
EPN	0.2	ND	ND	ND					
Guthion	0.5	ND	ND	ND					
Coumaphos	0.5	ND	ND	ND					
Dimethoate	0.1	ND	ND	ND					

NOTES: ND = none detected
( ) = alternate detection limit
- = not analyzed

APPENDIX O: ANALYTICAL RESULTS from Water Sampling at Crows Landing 319 Project - Field & Sampling Sites continued

LOCATION: Site 2 continued

Analysis	Detection Limit (ug/L)	06/22/94	06/22/94	01/10/95					
				(Storm)					
632 - Carbamates	SCS Sample #	62294S2	62294S3	11095S2					
			(blind)						
Aminocarb	1.0	-	-	-					
Barban	6.0	ND	ND	ND					
Carbaryl	6.0	ND	ND	ND					
Carbofuran	25.0	ND	ND	ND					
Chlorpropham	7.0	ND	ND	ND					
Diuron	1.0	ND	ND	**8.0**					
Fenuron	4.0	ND	ND	ND					
Fenuron-TCA	2.0	-	-	-					
Fluometuron	3.0	ND	ND	ND					
Linuron	1.0	-	-	ND					
Methiocarb	0.1	-	-	-					
Methomyl	7.0	ND	ND	ND					
Mexacarbate	1.0	-	-	-					
Monuron	3.0	ND	ND	ND					
Monuron-TCA	1.0	-	-	-					
Neburon	2.0	ND	ND	ND					
Oxamyl	3.0	ND	ND	ND					
Propham	7.0	ND	ND	ND					
Propoxur	30.0	ND	ND	ND					
Siduron	3.0	ND	ND	ND					

NOTES: ND = none detected
( ) = alternate detection limit
- = not analyzed

APPENDIX O: ANALYTICAL RESULTS from Water Sampling at Crows Landing 319 Project - Field & Sampling Sites continued

LOCATION: Site 6 (NALF entrance point)

Analysis	Detection Limit (ug/L)	06/10/92	01/13/93 (Storm)	08/26/93	06/22/94	01/10/95 (Storm)			
608 - Organochlorines	SCS Sample #	610926	113937	826931	62294S6	11395S6			
Alpha-BHC	0.05	ND	ND	ND	ND	ND			
Gamma-BHC	0.05	ND	ND	ND	ND	ND			
Heptachlor	0.05	ND	ND	ND	0.23	ND			
Beta-BHC	0.05	ND	ND	ND	ND	ND			
Delta-BHC	0.05	ND	ND	ND	ND	ND			
Aldrin	0.05	ND	ND	ND	ND	ND			
Heptachlor Epoxide	0.05	ND	ND	ND	ND	ND			
Endosulfan 1	0.05	ND	ND	ND	ND	0.06			
p,p'-DDE	0.05	ND	ND	ND	ND	ND			
Dieldrin	0.05	ND	ND	ND	ND	ND			
Endrin	0.05	ND	ND	ND	ND	ND			
p,p'-DDD	0.05	ND	ND	ND	ND	ND			
Endosulfan 2	0.05	ND	ND	ND	ND	0.16			
p,p'-DDT	0.05	ND	ND	ND	ND	ND			
Endrin Aldehyde	0.1	ND	ND	ND	ND	ND			
Endosulfan Sulfate	0.1	ND	ND	ND	ND	ND			
Methoxychlor	0.5	ND	ND	ND	ND	ND			
Toxaphene	1.0	ND	ND	ND	ND	ND			
Chlordane	0.2	ND	ND	ND	ND	0.06			
o,p'-DDT	0.05	ND	ND	ND	ND	ND			
o,p'-DDE	0.05	-	-	ND	-	ND			
o,p'-DDD	0.05	-	-	ND	-	ND			
PCB 1016	1.0	ND	ND	ND	ND	ND			
PCB 1221	1.0	ND	ND	ND	ND	ND			
PCB 1232	1.0	ND	ND	ND	ND	ND			
PCB 1242	1.0	ND	ND	ND	ND	ND			
PCB 1248	1.0	ND	ND	ND	ND	ND			
PCB 1254	1.0	ND	ND	ND	ND	ND			
PCB 1260	1.0	ND	ND	ND	ND	ND			

NOTES: ND = none detected
( ) = alternate detection limit
- = not analyzed

APPENDIX O: ANALYTICAL RESULTS from Water Sampling at Crows Landing 319 Project - Field & Sampling Sites continued

LOCATION: Site 6 continued

Analysis	Detection Limit (ug/L)	06/10/92	01/13/93	01/13/93	08/26/93	06/22/94	01/10/95		
			(Storm)	(Storm)			(Storm)		
622 - Organophosphates	SCS Sample #	610926	113935	113938	826931	62294S6	11095S6		
				(blind)					
TEPP	0.1	ND(0.5)	ND	ND	ND	ND	ND		
Dichlorvos	0.1	ND(0.5)	ND	ND	ND	ND	ND		
Phosdrin	0.1	ND(0.5)	ND	ND	ND	ND	ND		
Prophos	0.1	ND(0.5)	ND	ND	ND	ND	ND		
Phorate	0.1	ND(0.5)	ND	ND	ND	ND	ND		
Dibrom	0.5	ND	ND	ND	ND	ND	ND		
Demeton	0.1	ND(0.5)	ND	ND	ND	ND	ND		
Diazinon	0.1	ND(0.5)	ND	ND	ND	ND	ND		
Disulfoton	0.1	ND(0.5)	ND	ND	ND	ND	ND		
Fenchlorphos	0.1	ND(0.5)	ND	ND	ND	ND	ND		
m-Parathion	0.1	ND(0.5)	ND	ND	ND	ND	ND		
Malathion	0.1	ND(0.5)	ND	ND	ND	ND	ND		
Chlorpyrifos	0.1	ND(0.5)	ND	ND	ND	ND	ND		
Parathion	0.1	ND(0.5)	ND	ND	ND	ND	ND		
Fenthion	0.1	ND(0.5)	ND	ND	ND	ND	ND		
Merphos	0.1	ND(0.5)	ND	ND	ND	ND	ND		
Stirophos	0.2	ND(0.5)	ND	ND	ND	ND(0.1)	ND		
Sulprofos	0.1	ND(0.5)	ND	ND	ND	ND	ND		
Fensulfothion	0.5	ND	ND	ND	ND	ND	ND		
EPN	0.2	ND(0.5)	ND	ND	ND	ND	ND		
Guthion	1.0	ND(0.5)	ND	ND	ND	ND(0.05)	ND		
Coumaphos	1.0	ND	ND	ND	ND	ND(0.05)	ND		
Dimethoate	0.1	ND(0.5)	ND	ND	ND	ND	ND		

NOTES: ND = none detected
( ) = alternate detection limit
- = not analyzed

APPENDIX O: ANALYTICAL RESULTS from Water Sampling at Crows Landing 319 Project - Field & Sampling Sites continued

LOCATION: Site 6 continued

Analysis	Detection Limit (ug/L)	06/10/92	01/13/93	08/26/93	06/22/94	01/10/95			
			(Storm)			(Storm)			
632 - Carbamates	SCS Sample #	610926	113936	826931	62294S6	11095S6			
Aminocarb	1.0	ND	ND	ND	-	-			
Barban	1.0	ND	ND	ND	ND(6.0)	ND(6.0)			
Carbaryl	0.1	ND	ND	ND	ND(6.0)	ND(6.0)			
Carbofuran	0.2	ND	ND	ND	ND(25.0)	ND(25.0)			
Chlorpropham	1.0	ND	ND	ND	ND(7.0)	ND(7.0)			
Diuron	1.0	**1.9**	**3.1**	ND	**9.8**	**11.0**			
Fenuron	2.0	ND	ND	ND	ND(4.0)	ND(4.0)			
Fenuron-TCA	2.0	ND	ND	ND	-	-			
Fluometuron	1.0	ND	ND	ND	ND(3.0)	ND(3.0)			
Linuron	1.0	ND	ND	ND	-	-			
Methiocarb	0.1	**0.1**	ND	ND	-	-			
Methomyl	0.1	ND	ND	ND	ND(7.0)	ND(7.0)			
Mexacarbate	1.0	ND	ND	ND	-	-			
Monuron	1.0	ND	ND	ND	ND(3.0)	ND(3.0)			
Monuron-TCA	1.0	ND	ND	ND	-	-			
Neburon	1.0	ND	ND	ND	ND(2.0)	ND(2.0)			
Oxamyl	0.1	ND	ND	ND	ND(3.0)	ND(3.0)			
Propham	5.0	ND	ND	ND	ND(7.0)	ND(7.0)			
Propoxur	0.1	ND	ND	ND	ND(30.0)	ND(30.0)			
Siduron	10.0	ND	ND	ND	ND(3.0)	ND(3.0)			

NOTES: ND = none detected
( ) = alternate detection limit
- = not analyzed

TAB

Appendix P

APPENDIX P: GOSS MODEL PESTICIDE HAZARD POTENTIALS
(by field, soil types and pesticides applied)

Field	Soil Types	Pesticide Trade Name	Pesticide Common Name	Surface Loss Potential	Leaching Potential
1	C-101	Asana	Esfenvalerate	C-1, Z-1	C-3, Z-3
	C-102	Comite	Propargite	C-1, Z-1	C-3, Z-3
	Z-140	Kelthane	Dicofol	C-1, Z-1	C-3, Z-3
		Lannate	Methomyl	C-3, Z-3	C-3, Z-2
		Orthene	Acephate	C-3, Z-3	C-3, Z-3
		Sevin	Carbaryl	C-2, Z-2	C-3, Z-3
		Sonalan	Ethalfluralin	C-1, Z-1	C-3, Z-3
		Sulfur	Sulfur	C-3, Z-3	C-3, Z-3
		Tillam	Pebulate	C-2, Z-2	C-3, Z-2
		Treflan	Trifluralin	C-1, Z-1	C-3, Z-3
		Weed Killer 66	2,4-D Amine	C-2, Z-2	C-3, Z-2
2	C-102	Asana	Esfenvalerate	C-1, Z-1	C-3, Z-3
	C-106	Bayleton	Triadimefon	C-2, Z-2	C-3, Z-2
	Z-140	Cygon	Dimethoate	C-3, Z-3	C-3, Z-2
		Kelthane	Dicofol	C-1, Z-1	C-3, Z-3
		Lannate	Methomyl	C-3, Z-3	C-3, Z-2
		Orthene	Acephate	C-3, Z-3	C-3, Z-3
		Sonalan	Ethalfluralin	C-1, Z-1	C-3, Z-3
		Sulfur	Sulfur	C-3, Z-3	C-3, Z-3
		Thimet	Phorate	C-1, Z-1	C-3, Z-2
		Tillam	Pebulate	C-2, Z-2	C-3, Z-2
		Treflan	Trifluralin	C-1, Z-1	C-3, Z-3
		Weedar	MCPA Salt	C-3, Z-3	C-2, Z-1
3	C-102	Asana	Esfenvalerate	C-1, Z-1	C-3, Z-3
	C-106	Comite	Propargite	C-1, Z-1	C-3, Z-3
	Z-140	Dibrom	Naled	C-2, Z-2	C-3, Z-3
	C-102	Kelthane	Dicofol	C-1, Z-1	C-3, Z-3
	C-106	Lannate	Methomyl	C-3, Z-3	C-3, Z-2
	Z-140	Orthene	Acephate	C-3, Z-3	C-3, Z-3
		Sonalan	Ethalfluralin	C-1, Z-1	C-3, Z-3
		Sulfur	Sulfur	C-3, Z-3	C-3, Z-3
		Tillam	Pebulate	C-2, Z-2	C-3, Z-2
		Treflan	Trifluralin	C-1, Z-1	C-3, Z-3
		Weed Killer 66	2,4-D Amine	C-2, Z-2	C-3, Z-2
4	C-100	Asana	Esfenvalerate	C-1	C-3
	C-102	Comite	Propargite	C-1	C-3
	C-106	Cygon	Dimethoate	C-3	C-3
		Kelthane	Dicofol	C-1	C-3
		Monitor	Methamidophos	C-2	C-3
		Orthene	Acephate	C-3	C-3
		Sonalan	Ethalfluralin	C-1	C-3
		Tillam	Pebulate	C-2	C-3
		Treflan	Trifluralin	C-1	C-3

APPENDIX P: GOSS MODEL PESTICIDE HAZARD POTENTIALS continued

Field	Soil Types	Pesticide Trade Name	Pesticide Common Name	Surface Loss Potential	Leaching Potential
5	C-106	Comite	Propargite	C-1	C-3
		Dibrom	Naled	C-2	C-3
		Lannate	Methomyl	C-3	C-3
		Monitor	Methamidophos	C-2	C-3
		Sulfur	Sulfur	C-3	C-3
		Treflan	Trifluralin	C-1	C-3
6	C-102	Comite	Propargite	C-1	C-3
	C-106	Dibrom	Naled	C-2	C-3
		Lannate	Methomyl	C-3	C-3
		Monitor	Methamidophos	C-2	C-3
		Sulfur	Sulfur	C-3	C-3
		Treflan	Trifluralin	C-1	C-3
7	C-100	Cutlass	Bacillus Th.	C-3	C-3
	C-102	Cygon	Dimethoate	C-3	C-3
	C-106	Dibrom	Naled	C-2	C-3
		Kelthane	Dicofol	C-1	C-3
		Lannate	Methomyl	C-3	C-3
		Orthene	Acephate	C-3	C-3
		Sulfur	Sulfur	C-3	C-3
		Treflan	Trifluralin	C-1	C-3
		Weedar	MCPA Salt	C-3	C-2
8	C-100	Cutlass	Bacillus Th.	C-3	C-3
	C-102	Cygon	Dimethoate	C-3	C-3
		Furadan	Carbofuran	C-3	C-2
		Karmex	Diuron	C-1	C-3
		Kelthane	Dicofol	C-1	C-3
		Lannate	Methomyl	C-3	C-3
		Orthene	Acephate	C-3	C-3
		Sonalan	Ethalfluralin	C-1	C-3
		Sulfur	Sulfur	C-3	C-3
9	C-102	Cutlass	Bacillus Th.	C-3, V-3	C-3, V-3
	V-120	Lannate	Methomyl	C-3, V-3	C-3, V-2
	V-122	Monitor	Methamidophos	C-2, V-2	C-3, V-3
		Sulfur	Sulfur	C-3, V-3	C-3, V-3
		Treflan	Trifluralin	C-1, V-1	C-3, V-3
10	C-100	Comite	Propargite	C-1, V-1	C-3, V-3
	C-102	Cutlass	Bacillus Th.	C-3, V-3	C-3, V-3
	V-122	Cygon	Dimethoate	C-3, V-3	C-3, V-2
		Devrinol	Naproamide	C-1, V-1	C-3, V-2
		Furadan	Carbofuran	C-3, V-3	C-2, V-1
		Karmex	Diuron	C-1, V-1	C-3, V-2

APPENDIX P: GOSS MODEL PESTICIDE HAZARD POTENTIALS continued

Field	Soil Types	Pesticide Trade Name	Pesticide Common Name	Surface Loss Potential	Leaching Potential
10 cont.	C-100	Kelthane	Dicofol	C-1, V-1	C-3, V-3
	C-102	Lannate	Methomyl	C-3, V-3	C-3, V-2
	V-122	Monitor	Methamidophos	C-2, V-2	C-3, V-3
		Orthene	Acephate	C-3, V-3	C-3, V-3
		Sonalan	Ethalfluralin	C-1, V-1	C-3, V-3
		Sulfur	Sulfur	C-3, V-3	C-3, V-3
		Tillam	Pebulate	C-2, V-2	C-3, V-2
		Treflan	Trifluralin	C-1, V-1	C-3, V-3
11	C-100	Furadan	Carbofuran	C-3	C-2
	C-102	Karmex	Diuron	C-1	C-3
		Weedar	MCPA Salt	C-3	C-2
12	C-100	Betanex	Desmedipham	C-1	C-3
	C-106	Dibrom	Naled	C-2	C-3
		Lannate	Methomyl	C-3	C-3
		Lorsban	Chlorpyrifos	C-1	C-3
		Poast	Sethoxydim	C-3	C-3
		Sulfur	Sulfur	C-3	C-3
		Treflan	Trifluralin	C-1	C-3
13	C-106	Lorsban	Chlorpyrifos	C-1	C-3
14	C-106	Lorsban	Chlorpyrifos	C-1	C-3
15	C-106	Betanex	Desmedipham	C-1	C-3
		Comite	Propargite	C-1	C-3
		Dibrom	Naled	C-2	C-3
		Lannate	Methomyl	C-3	C-3
		Lorsban	Chlorpyrifos	C-1	C-3
		Poast	Sethoxydim	C-3	C-3
		Sulfur	Sulfur	C-3	C-3
		Treflan	Trifluralin	C-1	C-3
16	C-106	Comite	Propargite	C-1	C-3
		Furadan	Carbofuran	C-3	C-2
		Lorsban	Chlorpyrifos	C-1	C-3

1 = high probability of loss
2 = possibility of loss
3 = very low probability of loss

C = Capay Clay soils (types 100, 101, 102, 106) have intermediate surface loss potentials, nominal leaching potentials.
V = Vernalis soils (types 120, 122) have nominal surface loss potentials, intermediate leaching potentials.
Z = Zacharias soil (type 140) has a nominal surface loss potential, intermediate leaching potential.

TAB

APPENDIX Q

APPENDIX Q: NALF SOIL PROPERTIES & RATINGS

Map Symbol	Component Name	Soil-5 Rec #	Soil-6 Texture	Hydrol Group	Organic Matter	Surface Depth	K Factor	Water Table Depth	Slope %	Soil Surface Loss Potential	Soil Leaching Potential
100	Capay	CA0366	C	D	1-2%	20"	.24	6.0'	<2	Intermediate	Nominal
101	Capay	CA0367	C	D	1-2%	20"	.24	4.0-6.0'	<2	Intermediate	Nominal
102	Capay	CA0366	C	D	1-2%	20"	.24	6.0'	<2	Intermediate	Nominal
106	Capay	CA0366	C	D	1-2%	20"	.24	6.0'	<2	Intermediate	Nominal
120	Vernalis/	CA0611	CL	B	1-2%	20"	.32	6.0'	<2	Intermediate	Intermediate
	Zacharias	CA0985	CL	B	1-2%	20"	.37	6.0'	<2	Intermediate	Intermediate
122	Vernalis	CA0611	L	B	1-2%	20"	.37	>6.0'	<2	Intermediate	Intermediate
140	Zacharias	CA0985	CL	B	1-2%	14"	.37	>6.0'	<2	Intermediate	Intermediate

C = Clay
CL = Clay Loam
L = Loam

TAB

Appendix R

APPENDIX R: BMP USE HISTORIES

Field	1992	1993	1994
1	Crop rotation Cutback stream irrigation Field sump Furrow length reduction Gated pipe TW Ditch tarps TW Recovery system	Crop rotation Field sump TW Recovery system	Field sump Furrow length reduction TW Ditch tarps TW Recovery system Vegetative filter strip
2	Crop rotation Field sump Gated pipe	Field sump	Crop rotation Field sump Furrow length reduction TW Ditch tarps TW Recovery system
3	Crop rotation Cutback stream irrigation Gated pipe Grassed waterway Horseshoe drain TW Ditch tarps	Crop rotation Grassed waterway Horseshoe drain	Crop rotation Gated pipe Horseshoe drain TW Recovery system
4	Crop rotation Furrow dams Gated pipe Grassed waterway Horseshoe drains Sprinkler pre-irrigation	Crop rotation Grassed waterway Horseshoe drains TW Ditch tarps	Crop rotation Furrow length reduction Horseshoe drains TW Ditch tarps
5	Crop rotation Cutback stream irrigation Horseshoe drains Sprinkler germination TW Ditch tarps	Crop rotation Horseshoe drains	Crop rotation Horseshoe drains
6	Crop rotation Cutback stream irrigation Horseshoe drains Sprinkler germination Sprinkler irrigation TW Ditch tarps	Crop rotation Horseshoe drains	Crop rotation Horseshoe drains
7	Crop rotation Horseshoe drain Sprinkler germination Sprinkler irrigations	Horseshoe drain	Crop rotation Furrow length reduction Gated pipe Horseshoe drains TW Ditch tarps
8	Crop rotation Grass TW ditch Horseshoe drain Sprinkler pre-irrigation TW Ditch tarps	Crop rotation Grass TW ditch Horseshoe drain	Crop rotation Furrow length reduction Grass TW ditch Horseshoe drain

Field	1992	1993	1994
9	Cutback stream irrigation Field sump Gated pipe TW Ditch tarps	Crop rotation Field sump	Field sump Gated pipe
10	Cutback stream irrigation Field sump Gated pipe TW Ditch tarps	Crop rotation Field sump	Field sump Furrow length reduction TW Ditch tarps
11	Crop rotation Horseshoe drain	Crop rotation Horseshoe drain	Horseshoe drain
12	-	Horseshoe drain	-
13	-	-	-
14	-	-	-
15	-	-	Crop rotation
16	Horseshoe drain	Horseshoe drain	Crop rotation Horseshoe drain

Note: TW = Tailwater

TAB

APPENDIX S

APPENDIX S: MAIN SUMP EFFICIENCY IN SEDIMENT REDUCTION

Date	Site 2	Site 1	% Reduction
1992			
04/30	226	14	94
05/04	326	50	85
05/18	664	27	96
07/31	1810	62	97
08/13	216	58	73
08/19	193	69	64
09/01	354	73	79
1993			
06/01	560	103	82
08/20	394	230	42
08/31	29	98	(238% increase)*
09/20	42	73	(74% increase)*
1994			
05/24	456	44	90
05/26	494	99	80
05/31	390	130	67
06/03	486	45	91
06/22	500	46	91
06/23	412	72	83
06/30	401	113	72
07/08	883	55	94
07/14	663	61	91
07/26	964	165	83
08/04	758	74	90
08/17	538	71	87
08/25	172	55	68
09/12	439	59	87
09/26	131	49	63
1995			
01/10 (storm)	526	1170	(122% increase)

Site 2 = point of entrance to main sump

Site 1 = point of exit from main sump

* = No known irrigations were occuring on the Base during these sampling dates. All water flow was from upslope farming operations.

TAB

Appendix T

APPENDIX T: ANALYTICAL RESULTS from Water Sampling at Crows Landing 319 Project - Field & Sampling Sites

LOCATION: Field 6 - PAM Polymer Trials

Analysis	Detection Limit (ug/L)	06/02/93 Soilfix G1	Silage Corn 06/02/93	Silage Corn 06/02/93	Silage Corn 06/02/93	06/03/93 Soilfix 21J	Silage Corn 06/03/93	Silage Corn 06/03/93	Silage Corn 06/03/93
		1 ppm	source	control	treatment	1 ppm	source	control	treatment
608 - Organochlorines	SCS Sample #	20 gpm	62937	62933	62936	20 gpm	63939	63933	63936
		500 ft run	(si,fu)	(si,fu)	(si,fu)	500 ft run	(si,fu)	(si,fu)	(si,fu)
Alpha-BHC	0.05		ND	ND	ND		ND	ND	ND
Gamma-BHC	0.05		ND	ND	ND		ND	ND	ND
Heptachlor	0.05		ND	ND	ND		ND	ND	ND
Beta-BHC	0.05		ND	ND	ND		ND	ND	ND
Delta-BHC	0.05		ND	ND	ND		ND	ND	ND
Aldrin	0.05		ND	ND	ND		ND	ND	ND
Heptachlor Epoxide	0.05		ND	ND	ND		ND	ND	ND
Endosulfan 1	0.05		ND	ND	ND		ND	ND	ND
p,p'-DDE	0.05		ND	0.12	ND		ND	0.06	ND
Dieldrin	0.05		ND	ND	ND		ND	ND	ND
Endrin	0.05		ND	ND	ND		ND	ND	ND
p,p'-DDD	0.05		ND	ND	ND		ND	ND	ND
Endosulfan 2	0.05		ND	ND	ND		ND	ND	ND
p,p'-DDT	0.05		ND	0.12	0.06		0.05	0.09	0.08
Endrin Aldehyde	0.1		ND	ND	ND		ND	ND	ND
Endosulfan Sulfate	0.1		ND	ND	ND		ND	ND	ND
Methoxychlor	0.5		ND	ND	ND		ND	ND	ND
Toxaphene	1.0		ND	ND	ND		ND	ND	ND
Chlordane	0.2		ND	ND	ND		ND	ND	ND
o,p'-DDT	0.05		ND	ND	ND		ND	ND	ND
o,p'-DDE	0.05		ND	ND	ND		ND	ND	ND
o,p'-DDD	0.05		ND	ND	ND		ND	ND	ND
PCB 1016	1.0		ND	ND	ND		ND	ND	ND
PCB 1221	1.0		ND	ND	ND		ND	ND	ND
PCB 1232	1.0		ND	ND	ND		ND	ND	ND
PCB 1242	1.0		ND	ND	ND		ND	ND	ND
PCB 1248	1.0		ND	ND	ND		ND	ND	ND
PCB 1254	1.0		ND	ND	ND		ND	ND	ND
PCB 1260	1.0		ND	ND	ND		ND	ND	

NOTES:
ND = none detected
(#) = alternate detection limit
- = not analyzed

(gi) = gated pipe application
(si) = siphon pipe application
(sp) = sprinkler application

(bo) = border irrigation
(fl) = flood irrigation
(fu) = furrow irrigation

APPENDIX T: ANALYTICAL RESULTS from Water Sampling at Crows Landing 319 Project - Field & Sampling Sites

LOCATION: Field 6 - PAM Polymer Trials

Analysis	Detection Limit (ug/L)	06/02/93 Soilfix G1	Silage Corn 06/02/93	Silage Corn 06/02/93	Silage Corn 06/02/93	06/03/93 Soilfix 21J	Silage Corn 06/03/93	Silage Corn 06/03/93	Silage Corn 06/03/93
		1 ppm	source	control	treatment	1 ppm	source	control	treatment
622 - Organophosphates	SCS Sample #	20 gpm	62937	62931	62934	20 gpm	63937	63931	63934
		500 ft run	(si,fu)	(si,fu)	(si,fu)	500 ft run	(si,fu)	(si,fu)	(si,fu)
TEPP	0.1		ND	ND	ND		ND	ND	ND
Dichlorvos	0.1		ND	ND	ND		ND	ND	ND
Phosdrin	0.1		ND	ND	ND		ND	ND	ND
Prophos	0.1		ND	ND	ND		ND	ND	ND
Phorate	0.1		ND	ND	ND		ND	ND	ND
Dibrom	0.5		ND	ND	ND		ND	ND	ND
Demeton	0.1		ND	ND	ND		ND	ND	ND
Diazinon	0.1		ND	ND	ND		ND	ND	ND
Disulfoton	0.1		ND	ND	ND		ND	ND	ND
Fenchlorphos	0.1		ND	ND	ND		ND	ND	ND
m-Parathion	0.1		ND	ND	ND		ND	ND	ND
Malathion	0.1		ND	ND	ND		ND	ND	ND
Chlorpyrifos	0.1		ND	ND	ND		ND	ND	ND
Parathion	0.1		ND	ND	ND		ND	ND	ND
Fenthion	0.1		ND	ND	ND		ND	ND	ND
Merphos	0.1		ND	ND	ND		ND	ND	ND
Stirophos	0.1		ND	ND	ND		ND	ND	ND
Sulprofos	0.1		ND	ND	ND		ND	ND	ND
Fensulfothion	0.5		ND	ND	ND		ND	ND	ND
EPN	0.1		ND	ND	ND		ND	ND	ND
Guthion	0.5		ND	ND	ND		ND	ND	ND
Coumaphos	0.5		ND	ND	ND		ND	ND	ND
Dimethoate	0.1		ND	ND	ND		ND	ND	ND

NOTES:
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(sp) = sprinkler application

(bo) = border irrigation
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(fu) = furrow irrigation

APPENDIX T: ANALYTICAL RESULTS from Water Sampling at Crows Landing 319 Project - Field & Sampling Sites

LOCATION: Field 6 - PAM Polymer Trials

	Detection	06/02/93	Silage Corn	Silage Corn	Silage Corn	06/03/93	Silage Corn	Silage Corn	Silage Corn
Analysis	Limit (ug/L)	Soilfix G1	06/02/93	06/02/93	06/02/93	Soilfix 21J	06/03/93	06/03/93	06/03/93
		1 ppm	source	control	treatment	1 ppm	source	control	treatment
632 - Carbamates	SCS Sample #	20 gpm	62938	62932	62935	20 gpm	63938	63932	62935
		500 ft run	(si,fu)	(si,fu)	(si,fu)	500 ft run	(si,fu)	(si,fu)	(si,fu)
Aminocarb	1.0		ND	ND	ND		ND	ND	ND
Barban	1.0		ND	ND	ND		ND	ND	ND
Carbaryl	0.5		ND	ND	ND		ND	ND	ND
Carbofuran	1.0		ND	ND	ND		ND	ND	ND
Chlorpropham	1.0		ND	ND	ND		ND	ND	ND
Diuron	1.0		ND	ND	ND		ND	ND	ND
Fenuron	2.0		ND	ND	ND		ND	ND	ND
Fenuron-TCA	2.0		ND	ND	ND		ND	ND	ND
Fluometuron	1.0		ND	ND	ND		ND	ND	ND
Linuron	1.0		ND	ND	ND		ND	ND	ND
Methiocarb	0.5		ND	ND	ND		ND	ND	ND
Methomyl	0.5		ND	ND	ND		ND	ND	ND
Mexacarbate	1.0		ND	ND	ND		ND	ND	ND
Monuron	1.0		ND	ND	ND		ND	ND	ND
Monuron-TCA	1.0		ND	ND	ND		ND	ND	ND
Neburon	1.0		ND	ND	ND		ND	ND	ND
Oxamyl	0.5		ND	ND	ND		ND	ND	ND
Propham	5.0		ND	ND	ND		ND	ND	ND
Propoxur	0.5		ND	ND	ND		ND	ND	ND
Siduron	10.0		ND	ND	ND		ND	ND	ND

NOTES: ND = none detected
(#) = alternate detection limit
\- = not analyzed

(gi) = gated pipe application
(si) = siphon pipe application
(sp) = sprinkler application

(bo) = border irrigation
(fl) = flood irrigation
(fu) = furrow irrigation

APPENDIX T: ANALYTICAL RESULTS from Water Sampling at Crows Landing 319 Project - Field & Sampling Sites

LOCATION: Field 10 - PAM Polymer Trial

Analysis	Detection Limit (ug/L)	Soilfix G1	Dry Limas 06/23/94	Dry Limas 06/23/94	Dry Limas 06/23/94				
		5 ppm	source	control	treatment				
608 - Organochlorines	SCS Sample #	15 gpm	62394S	62394C	62394T				
		500 ft run	(si,fu)	(si,fu)	(si,fu)				
Alpha-BHC	0.05		ND	ND	ND				
Gamma-BHC	0.05		ND	ND	ND				
Heptachlor	0.05		ND	ND	ND				
Beta-BHC	0.05		ND	ND	ND				
Delta-BHC	0.05		ND	ND	ND				
Aldrin	0.05		ND	ND	ND				
Heptachlor Epoxide	0.05		ND	ND	ND				
Endosulfan 1	0.05		ND	ND	0.10				
p,p'-DDE	0.05		ND	ND	ND				
Dieldrin	0.05		ND	ND	ND				
Endrin	0.05		ND	ND	ND				
p,p'-DDD	0.05		ND	ND	ND				
Endosulfan 2	0.05		ND	ND	ND				
p,p'-DDT	0.05		ND	0.12	0.09				
Endrin Aldehyde	0.1		ND	ND	ND				
Endosulfan Sulfate	0.1		ND	ND	ND				
Methoxychlor	0.5		ND	3.3	2.1				
Toxaphene	1.0		ND	ND	ND				
Chlordane	0.2		ND	ND	ND				
o,p'-DDT	0.05		ND	ND	ND				
o,p'-DDE	0.05		-	-	-				
o,p'-DDD	0.05		-	-	-				
PCB 1016	1.0		ND	ND	ND				
PCB 1221	1.0		ND	ND	ND				
PCB 1232	1.0		ND	ND	ND				
PCB 1242	1.0		ND	ND	ND				
PCB 1248	1.0		ND	ND	ND				
PCB 1254	1.0		ND	ND	ND				
PCB 1260	1.0		ND	ND	ND				

NOTES:
ND = none detected
(#) = alternate detection limit
- = not analyzed

(gi) = gated pipe application
(si) = siphon pipe application
(sp) = sprinkler application

(bo) = border irrigation
(fl) = flood irrigation
(fu) = furrow irrigation

APPENDIX T: ANALYTICAL RESULTS from Water Sampling at Crows Landing 319 Project - Field & Sampling Sites

LOCATION: Field 10 - PAM Polymer Trial

Analysis	Detection Limit (ug/L)	Soilfix G1	Dry Limas 06/23/94	Dry Limas 06/23/94	Dry Limas 06/23/94				
		5 ppm	source	control	treatment				
622 - Organophosphates	SCS Sample #	15 gpm	62394S	62394C	62394T				
		500 ft run	(si,fu)	(si,fu)	(si,fu)				
TEPP	0.1		ND	ND	ND				
Dichlorvos	0.1		ND	ND	ND				
Phosdrin	0.1		ND	ND	ND				
Prophos	0.1		ND	ND	ND				
Phorate	0.1		ND	ND	ND				
Dibrom	0.5		ND	ND	ND				
Demeton	0.1		ND	ND	ND				
Diazinon	0.1		ND	ND	ND				
Disulfoton	0.1		ND	ND	ND				
Fenchlorphos	0.1		ND	ND	ND				
m-Parathion	0.1		ND	ND	ND				
Malathion	0.1		ND	ND	ND				
Chlorpyrifos	0.1		ND	ND	ND				
Parathion	0.1		ND	ND	ND				
Fenthion	0.1		ND	ND	ND				
Merphos	0.1		ND	ND	ND				
Stirophos	0.2		ND	ND	ND				
Sulprofos	0.1		ND	ND	ND				
Fensulfothion	0.5		ND	ND	ND				
EPN	0.2		ND	ND	ND				
Guthion	1.0		ND	ND	ND				
Coumaphos	1.0		ND	ND	ND				
Dimethoate	0.1		ND	ND	ND				

NOTES:
ND = none detected
(#) = alternate detection limit
- = not analyzed

(gi) = gated pipe application
(si) = siphon pipe application
(sp) = sprinkler application

(bo) = border irrigation
(fl) = flood irrigation
(fu) = furrow irrigation

APPENDIX T: ANALYTICAL RESULTS from Water Sampling at Crows Landing 319 Project - Field & Sampling Sites

LOCATION: Field 10 - PAM Polymer Trial

Analysis	Detection Limit (ug/L)	Soilfix G1	Dry Limas	Dry Limas	Dry Limas				
			06/23/94	06/23/94	06/23/94				
		5 ppm	source	control	treatment				
632 - Carbamates	SCS Sample #	15 gpm	62394S	62394C	62394T				
		500 ft run	(si,fu)	(si,fu)	(si,fu)				
Aminocarb	1.0		-	-	-				
Barban	6.0		ND	ND	ND				
Carbaryl	6.0		ND	ND	ND				
Carbofuran	25.0		ND	ND	ND				
Chlorpropham	7.0		ND	ND	ND				
Diuron	1.0		ND	ND	ND				
Fenuron	4.0		ND	ND	ND				
Fenuron-TCA	2.0		-	-	-				
Fluometuron	3.0		ND	ND	ND				
Linuron	1.0		-	-	-				
Methiocarb	0.1		-	-	-				
Methomyl	7.0		ND	ND	ND				
Mexacarbate	1.0		-	-	-				
Monuron	3.0		ND	ND	ND				
Monuron-TCA	1.0		-	-	-				
Neburon	2.0		ND	ND	ND				
Oxamyl	3.0		ND	ND	ND				
Propham	7.0		ND	ND	ND				
Propoxur	30.0		ND	ND	ND				
Siduron	3.0		ND	ND	ND				

NOTES:

ND = none detected
(#) = alternate detection limit
- = not analyzed

(gi) = gated pipe application
(si) = siphon pipe application
(sp) = sprinkler application

(bo) = border irrigation
(fl) = flood irrigation
(fu) = furrow irrigation

TAB

Appendix U

APPENDIX U: LIMITED PAM POLYMER BIO-ASSAY RESULTS

Sample ID: SCS62394S **Source water**

		Control	250 mg/L	400 mg/L	500 mg/L	600 mg/L	750 mg/L
Initial	6/25/94						
	pH	7.45	7.57	7.52	7.54	7.55	7.53
	D.O.	6.13	7.63	8.55	8.77	8.23	7.93
	Temp	21^{o}C	21^{o}C	21^{o}C	21^{o}C	21^{o}C	21^{o}C
24 hrs	06/26/94						
	pH	7.05	7.27	7.34	7.35	7.41	7.44
	D.O.	6.72	7.39	8.15	8.22	7.91	7.82
	Temp	21^{o}C	21^{o}C	21^{o}C	21^{o}C	21^{o}C	21^{o}C
Mortalities		0	0	0	0	0	0
48 hrs	06/27/94						
	pH	7.13	7.09	7.07	7.07	7.06	7.08
	D.O.	7.45	7.42	8.23	8.09	7.82	7.73
	Temp	20^{o}C	20^{o}C	20^{o}C	20^{o}C	20^{o}C	20^{o}C
Mortalities		0	0	0	0	0	0
72 hrs	06/28/94						
	pH	7.25	7.19	7.12	7.11	7.03	7.09
	D.O.	7.25	7.14	7.96	7.34	7.66	7.51
	Temp	21^{o}C	21^{o}C	21^{o}C	21^{o}C	21^{o}C	21^{o}C
Mortalities		0	0	0	0	0	0
96 hrs	06/29/94						
	pH	7.26	7.19	7.12	7.13	7.08	7.15
	D.O.	7.59	6.98	7.85	6.50	7.06	7.27
	Temp	21^{o}C	21^{o}C	21^{o}C	21^{o}C	21^{o}C	21^{o}C
Mortalities		0	0	0	0	0	0
Total Mortalities		0	0	0	0	0	0

Species: Pimephales Promelas
Common Name: Fathead Minnow
Supplier: Thomas Fish Farm
Dead in Acclimation Tank: <1%
Average Length: 32 mm

EPA Method: LC50
Dilution Water: Soft Reconstituted DI Water
Number per Tank: 20
Tank Volume: 10 Liters
Average Weight: 0.39 g

Initial Control Hardness: 40 mg/L

Final Control Hardness: 40 mg/L

Result/Notes: There were no significant mortalities observed in this test. LC50 > 500m/L.

APPENDIX U: LIMITED PAM POLYMER BIO-ASSAY RESULTS continued

Sample ID: SCS62394C **Control furrow**

		Control	250 mg/L	400 mg/L	500 mg/L	600 mg/L	750 mg/L
Initial	6/25/94						
	pH	7.45	7.54	7.45	7.43	7.58	7.58
	D.O.	6.13	8.17	8.39	8.27	7.45	7.19
	Temp	21°C	21°C	21°C	21°C	21°C	21°C
24 hrs	06/26/94						
	pH	7.05	7.38	7.34	7.37	7.40	7.39
	D.O.	6.72	7.96	8.16	7.91	7.36	7.01
	Temp	21°C	21°C	21°C	21°C	21°C	21°C
Mortalities		0	0	0	0	0	0
48 hrs	06/27/94						
	pH	7.13	7.06	7.09	7.08	7.07	6.97
	D.O.	7.45	7.40	7.82	7.54	7.22	7.56
	Temp	20°C	20°C	20°C	20°C	20°C	20°C
Mortalities		0	0	0	0	0	0
72 hrs	06/28/94						
	pH	7.25	7.08	7.08	7.09	7.03	6.86
	D.O.	7.25	7.57	7.67	7.59	7.14	6.49
	Temp	21°C	21°C	21°C	21°C	21°C	21°C
Mortalities		0	0	0	0	0	0
96 hrs	06/29/94						
	pH	7.26	7.19	7.16	7.14	7.12	6.94
	D.O.	7.59	6.88	6.90	7.53	6.40	6.71
	Temp	21°C	21°C	21°C	21°C	21°C	21°C
Mortalities		0	0	0	0	0	0
Total Mortalities		0	0	0	0	0	0

Species: Pimephales Promelas
Common Name: Fathead Minnow
Supplier: Thomas Fish Farm
Dead in Acclimation Tank: <1%
Average Length: 33 mm

EPA Method: LC50
Dilution Water: Soft Reconstituted DI Water
Number per Tank: 20
Tank Volume: 10 Liters
Average Weight: 0.43 g

Initial Control Hardness: 40 mg/L

Final Control Hardness: 40 mg/L

Result/Notes: There were no significant mortalities observed in this test. LC50 > 500m/L.

APPENDIX U: LIMITED PAM POLYMER BIO-ASSAY RESULTS continued

Sample ID: SCS62394T **Treatment furrow**

		Control	250 mg/L	400 mg/L	500 mg/L	600 mg/L	750 mg/L
Initial	6/25/94						
	pH	7.45	7.65	7.66	7.68	7.65	7.67
	D.O.	6.13	7.15	7.95	7.49	7.05	7.18
	Temp	21°C	21°C	21°C	21°C	21°C	21°C
24 hrs	06/26/94						
	pH	7.05	7.20	7.29	7.30	7.33	7.28
	D.O.	6.72	7.11	7.83	7.38	6.91	7.25
	Temp	21°C	21°C	21°C	21°C	21°C	21°C
Mortalities		0	0	0	0	0	0
48 hrs	06/27/94						
	pH	7.13	7.07	7.09	7.11	7.11	7.10
	D.O.	7.45	7.35	7.51	7.22	6.49	7.16
	Temp	20°C	20°C	20°C	20°C	20°C	20°C
Mortalities		0	0	0	0	0	0
72 hrs	06/28/94						
	pH	7.25	7.04	7.01	7.04	7.04	7.03
	D.O.	7.25	7.21	7.36	7.10	7.13	6.75
	Temp	21°C	21°C	21°C	21°C	21°C	21°C
Mortalities		0	0	0	0	0	0
96 hrs	06/29/94						
	pH	7.26	7.12	7.09	7.11	7.16	7.16
	D.O.	7.59	7.40	6.90	6.44	6.75	6.66
	Temp	21°C	21°C	21°C	21°C	21°C	21°C
Mortalities		0	0	0	0	0	0
Total Mortalities		0	0	0	0	0	0

Species: Pimephales Promelas
Common Name: Fathead Minnow
Supplier: Thomas Fish Farm
Dead in Acclimation Tank: <1%
Average Length: 33 mm

EPA Method: LC50
Dilution Water: Soft Reconstituted DI Water
Number per Tank: 20
Tank Volume: 10 Liters
Average Weight: 0.38 g

Initial Control Hardness: 40 mg/L

Final Control Hardness: 40 mg/L

Result/Notes: There were no significant mortalities observed in this test. LC50 > 500m/L.

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